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ABSTRACT

The critical thinking movement is responding nationwide to the challenge of teaching thought processes to students. This volume contains 10 articles addressing critical thinking and the instruction of higher-level thinking skills: (1) "Critical Thinking: What, Why, and How," by Richard Paul; (2) "Teaching Critical Thinking across the Curriculum," by John Chaffee; (3) "Assessing Critical Thinking," by Lucy S. Cromwell; (4) "Skipping on the Brink of the Abyss: Teaching Thinking through Writing," by James J. Sheridan; (5) "Teaching Critical Thinking in the Social Sciences," by Carol Lynn H. Knight; (6) "The Critical Literacy Seminar: A Faculty Development and Rejuvenation Strategy," by Margaret B. Lee, Trudy H. Bers, and Richard Storinger; (7) "Great Teaching, Great Learning: Classroom Climate, Innovative Methods, and Critical Thinking," by Lawrence P. Litecky; (8) "Forced To Think: The Title V Mandate in California," by John Feare; (9) "Teaching Critical Thinking in Vocational-Technical and Occupational Classes," by George A. Heyman and Elaine R. Daly; and (10) "Sources and Information: Critical Thinking Skills Instruction in the Community College," by Diane Hirshberg. (JMC)

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NEW DIRECTIONS FOR COMMUNITY COLLEGES

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Critical Thinking: Educational Imperative

Cynthia A. Barnes
EDITOR

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NEW DIRECTIONS FOR COMMUNITY COLLEGES

Arthur M. Cohen
EDITOR-IN-CHIEF
Florence B. Brawer
ASSOCIATE EDITOR

Critical Thinking: Educational Imperative

Cynthia A. Barnes
Community College of Aurora, Colorado

EDITOR

Number 77, Spring 1992

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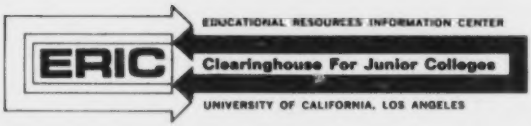

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EDITOR'S NOTES

David Kearns, chief executive officer of Xerox Corporation, observed that "according to the National Assessment of Educational Progress, only a small percentage of the young people sampled in its recent studies can reason effectively about what they read and write. That means that the majority don't have the critical thinking skills we need in an economy like ours that's based on information and knowledge. The office, not the factory, is the center of our working lives. The backbone of the new American work force will be people who deal mainly with the formation and refinement of ideas" (Applebee, Langer, and Mullis, 1987, p. 3). The teaching of English, accounting, and nursing simply is not enough. *Thought must be taught.* Without the ability to adapt, decide, and problem solve, community college students may find themselves only partially prepared to face the challenges before them.

The critical thinking movement, nationwide, is beginning to respond to this challenge. Elementary schools, primarily through gifted and talented programs, and some secondary schools have begun thinking skills programs, as have some liberal arts colleges. Community college curricula must also address critical thinking, analysis, values clarification, and related thinking skills.

But how are these higher-level thinking skills integrated with content? How are they taught across instructional disciplines? How are faculty and administrators to be involved in such projects? How can these initiatives be made successful and enduring?

These and other questions are answered in this volume, *Critical Thinking: Educational Imperative.* The authors were selected because of their firsthand participation in the critical thinking movement. All of them have taught critical thinking: in their classrooms, to their colleagues, to faculty at a number of institutions. All of them know firsthand the challenges that teaching for critical thinking poses, as well as the benefits and rewards gained by both students and faculty members. And all of them know that critical thinking is the educational imperative for quality education in the 1990s and beyond.

In Chapter One, Richard Paul defines critical thinking, discusses why it should be taught, and how it can be taught. In Chapter Two, John Chaffee discusses the teaching of critical thinking across the curriculum. Specific ways to assess critical thinking are presented by Lucy S. Cromwell in Chapter Three. James J. Sheridan, in Chapter Four, provides specific suggestions for teaching critical thinking in writing and humanities courses, and in Chapter Five, Carol Lynn H. Knight addresses the teaching of critical thinking in the social sciences. The task of making the teaching of critical thinking an enduring reality, as well as a source of rejuvenation and development for faculty,

is the focus of Margaret B. Lee, Trudy H. Bers, and Richard Storinger in Chapter Six. In Chapter Seven, Lawrence P. Litecky addresses the importance of classroom climate and teaching methods in creating a fertile environment for the teaching of critical thinking. In Chapter Eight, John Feare discusses the genesis and evolution of the California mandate to teaching critical thinking in every community college classroom. In Chapter Nine, George A. Heyman and Elaine R. Daly tell vocational-technical and occupational faculty how they can teach for critical thinking. Finally, in Chapter Ten, Diane Hirshberg provides an annotated bibliography on the integration of critical thinking skills into the community college curriculum.

Thought must be taught. And so it will.

Cynthia A. Barnes
Editor

Reference

Applebee, A. N., Langer, J. A., and Mullis, I.V.S. *Learning to Be Literate in America: Reading, Writing, and Reasoning. The Nation's Report Card.* Report by the National Assessment of Educational Progress. Princeton, N.J.: Educational Testing Service, 1987.

CYNTHIA A. BARNES is dean of educational development and faculty services at the Community College of Aurora, Colorado.

In teaching, all instructors, knowingly or unknowingly, foster either higher- or lower-order learning. Only higher-order learning produces knowledge, a disciplined mind, and a mastery of content.

Critical Thinking: What, Why, and How

Richard Paul

The Logically Illogical Animal

Paradoxically, humans are not simply the only logical animals, they are also the only illogical ones. They are the only animals that use meanings—ideas, concepts, analogies, metaphors, models, theories, and explanations—to make sense of things and to understand, predict, and control things. They are also the only animals that use meanings to negate, contradict, and deceive themselves, to misconceive, distort, and stereotype, and to be dogmatic, prejudiced, and narrow-minded. Humans are the only animals whose thinking can be characterized as clear, precise, accurate, relevant, consistent, profound, and fair; they are also the only animals whose thinking is often imprecise, vague, inaccurate, irrelevant, superficial, trivial, and biased.

Critical thinking makes sense in light of these paradoxical dichotomies. Humans should not simply trust their instincts. They should not unquestioningly believe what spontaneously occurs to them. They should not accept as true everything that is taught as true. They should not assume that their experience is unbiased. They need to formulate, since they are not born with, intellectually sound standards for belief, truth, and validity. They need to cultivate habits and traits that integrate these standards into their lives.

The logical-illogical dichotomy of human nature has implications for human learning. One can learn through the rational capacities of the human mind or through its irrational propensities. There are profound reasons for cultivating the human capacity to discipline and direct thought through commitment to intellectual standards. Unfortunately, much aca-

demic learning is of a lower order: undisciplined, associative, and inert. Much of it is an obstacle rather than an aid to education. Much of it blocks genuine understanding.

What students often learn well—that school is a place to repeat back what teachers or textbooks say and that to follow the correct steps in the correct order is to get the correct answer—blocks them from thinking seriously about what they learn. Although there are circumstances in everyday life where lower-order rote learning is sufficient, those circumstances are diminishing rapidly in number. At the same time, the damage done by multiple forms of prejudice and narrowmindedness—academic, social, personal, professional, religious, racial, national, and ideological—continues to mount. The irony is that higher-order learning can be cultivated in almost any academic setting. By focusing on the rational capacities of students' minds, by designing instruction so that students explicitly grasp the sense and the logic of what they learn, we can make all additional learning easier for them. Higher-order learning multiplies comprehension and insight; lower-order rote memorization multiplies misunderstanding and prejudice. Higher-order learning stimulates and empowers, whereas lower-order learning discourages and limits the learner. Although very little instruction is deliberately aimed at lower-order learning, that type of learning most often emerges. "Good" students have developed techniques for short-term rote memorization and performance; "poor" students have developed none. But few students understand what it means to think analytically through the content of a subject; few use critical thinking as a tool for acquiring knowledge.

Didactic lectures, extensive coverage of content, and mindless drill combine with student passivity to perpetuate the lower-order thinking and learning that students have come to associate with school. When students do not actively think their way to conclusions, when they do not discuss their thinking with other students or their professors, when they do not entertain a variety of points of view, analyze concepts, theories, or explanations from their own points of view, actively question the meaning and implications of what they learn, compare what they learn to their experiences, tackle nonroutine problems, examine assumptions, or gather evidence, they do not achieve higher-order learning. They end their schooling with a jumble of fragmentary opinions, rigidly understood procedures, and undisciplined beliefs. They have gained little knowledge or insight. They are at best trained, not educated, not critical thinkers or persons. As a result, their adaptability, their capacity to learn on the job and in their personal and civic lives, is severely limited. Their ability to mature intellectually and morally, and their capacity and motivation to learn, are stunted.

Recognition of the social, political, and moral implications of lower-order learning is growing with the recognition that both developed and underdeveloped nations face complex problems that cannot be solved without significant intellectual development of their people. Such growth pre-

supposes increased reflective and critical thought about deep-seated problems of environmental damage, human relations, overpopulation, rising expectations, diminishing resources, global competition, personal goals, and ideological conflict.

The problem of lower-order learning will not be solved outside of school, for the lay person is increasingly bombarded with diverse contradictory explanations and prescriptions. Lacking experience with complex thinking, unused to critical thinking, the ordinary person retreats in the face of complexity to simplistic pictures of the world. The mass media feed this demand for simple-minded answers; politicians cater to it. If schools and colleges do not shift their orientations from rote memorization to critical thinking, there is little possibility that significant change will occur outside of school.

To effect this shift, teachers and professors must reconceptualize knowledge, learning, and literacy in ways that are more realistic and in tune with the modern world. They must link the acquisition of knowledge to dialogical and dialectical thinking so that their students become comfortable with complexity and ambiguity and learn to adjust their thinking to an accelerating pace of changes. Educators should seek to develop minds that are not fixated on present beliefs and are not easily manipulated or taken in by propaganda. Our understanding of the need for higher-order thinking skills and the appropriate ways to develop them rests on a solid theoretical foundation and a growing research base. However, the academic implementation of these ideas is merely beginning; its full development around the world is probably ten to twenty-five years in the future.

Knowledge as Thinking

We often talk of knowledge as though it could be divorced from thinking, as though it could be gathered up by one person and given to another in the form of a collection of sentences. When we talk in this way we forget that knowledge, by its very nature, depends on thought. Knowledge is produced by thought, analyzed by thought, comprehended, organized, evaluated, maintained, and transformed by thought. Knowledge exists, properly speaking, only in minds that have comprehended and justified it through thought. And when we say *think* we mean *think critically*. Knowledge should not be confused with belief or with symbolic representation of belief. Humans can easily believe things that are false or believe things to be true without *knowing* them to be so. A book contains knowledge only in a derivative sense, only because minds can thoughtfully read it and through that process gain knowledge. Unfortunately, we often design instruction as though recall were equivalent to knowledge.

We need to remember that all knowledge exists in and through critical thought. All of the disciplines—mathematics, physics, chemistry, biology,

geography, sociology, anthropology, history, philosophy, and so on—are modes of thought. We know mathematics not to the extent that we can recite mathematical formulas, but only to the extent that we can think mathematically. We know science not to the extent that we can recall sentences from our science textbooks, but only to the extent that we can think scientifically. We understand sociology only to the extent that we can think sociologically, history only to the extent that we can think historically, and philosophy only to the extent that we can think philosophically.

When we teach each subject in such a way that students pass courses without thinking their way into the knowledge that these subjects make possible, students leave those courses without any more knowledge than they had when they entered them. When we sacrifice thought to gain coverage, we sacrifice knowledge at the same time. The issue is not shall we sacrifice knowledge to spend time on thought, but rather shall we continue to sacrifice both knowledge and thought for the mere appearance of learning, for mislearning, for fragmentary learning, for transitory learning, for inert, confused learning?

Lower-Order Learning

We can understand the various forms of lower-order learning by understanding the relative lack of logic that informs them. Paradigmatically, lower-order learning is learning by sheer association or rote. Hence students come to think of history class, for example, as a place where they hear names and dates and places, where they try to remember them and state them on tests. Mathematics comes to be thought of as numbers, symbols, and formulas, mysterious things that they mechanically manipulate as instructed to get the right answer. Literature is often thought of as uninteresting stories to remember along with what the teacher said is important about them.

Schoenfeld (1982, p. 29) has demonstrated that lower-order learning dominates schooling, even in mathematics classes, which often pass for paradigms of disciplined, thought-filled learning. However, most students are so far from thinking mathematically, most math instruction so ineffective in achieving that end, that, as Schoenfeld concludes, "most instruction in mathematics is, in a very real sense, deceptive and possibly fraudulent. . . . All too often we focus on a narrow collection of well-defined tasks and train students to execute those tasks in a routine, if not algorithmic fashion. Then we test the students on tasks that are very close to the ones they have been taught. If they succeed on those problems, we and they congratulate each other on the fact that they have learned some powerful mathematical techniques. In fact, they may be able to use such techniques mechanically while lacking some rudimentary thinking skills. To allow them, and ourselves, to believe that they 'understand' the mathematics is

deceptive and fraudulent." Schoenfeld cites a number of studies to justify this characterization of math instruction and its lower-order consequences. He also gives a number of striking examples, such as the following:

> At the University of Rochester 85 percent of the freshman class takes calculus, and many go on. Roughly half of our students see calculus as their last mathematics course. Most of these students will never apply calculus in any meaningful way (if at all) in their studies, or in their lives. They complete their studies with the impression that they know some very sophisticated and high-powered mathematics. They can find the maxima of complicated functions, determine exponential decay, compute the volumes of surfaces of revolution, and so on. But the fact is that these students know barely anything at all. The only reason they can perform with any degree of competency on their final exams is that the problems on the exams are nearly carbon copies of problems they have seen before; the students are not being asked to think, but merely to apply well-rehearsed schemata for specific kinds of tasks. Tim Keifer and I studied students' abilities to deal with pre-calculus versions of elementary word problems such as the following:
>
> *An 8-foot fence is located 3 feet from a building. Express the length L of the ladder which may be leaned against the building and just touch the top of the fence as a function of the distance X between the foot of the ladder and the base of the building.*
>
> We were not surprised to discover that only 19 of 120 attempts at such problems (four each for 30 students) yielded correct answers, or that only 65 attempts produced answers of any kind [1982, p. 28].

The result of lower-order learning of this kind is that students leave with a jumble of undigested fragments left over after they have forgotten most of what they had to cram into their short-term memory for particular tests. They rarely grasp the logic of what they learn. Rarely do they relate what they learn to their own experiences and critique their learning and their past experience with respect to each other. Rarely do they try to test what they learn in everyday life. Rarely do they ask, "Why is this so? How does this relate to what I already learned? How does this relate to what I am learning in other classes?" In a nutshell, very few students know what it means to rationally organize what they learn.

Consider, for example, the manner in which students relate to their native language. If one questions them about the meanings of words, their account is typically incoherent. They often say that everyone has their own meanings for all of the words that they use, not noticing that were this true, we would not be able to understand each other.

Students speak and write vaguely because they have no criteria for choosing words; they merely write what pops into their heads. They do not

realize that every language has a highly refined logic that one must learn to express oneself precisely. They do not realize that even words similar in meaning typically have different implications.

I am not complaining that students do not distinguish the logic of particular words but rather that they do not recognize that any words have a logic. They do not recognize that words generate implications, whether the user recognizes them or not. In not recognizing that what they say has implications, they do not recognize their responsibility to have evidence to support what their words imply. As a result, they routinely confuse believing with knowing, reasoning with rationalizing, evidence with conclusion, data with interpretation, and so on. Therefore, when reading, they cannot identify the evidence that an author needs to justify the implications of what is written. When others speak to them, they do not recognize that the truth or falsity of the words depends on whether evidence or reason justifies the implications of the words used.

The failure of students to understand the logic of ordinary language and the intellectual discipline inherent in educated usage spills over into a failure to understand the logic of technical languages and the intellectual discipline necessary to use technical terms accurately. Students then do not understand how to weave technical concepts into discourse in everyday language.

Students fail to see that every technical term has logical relationships with other technical terms and that some terms are logically more basic than others. Consequently, they do not look for seminal terms as they study an area. They do not strive to translate technical terms into analogies and ordinary words that they understand. They do not look for the basic assumptions of the disciplines that they study. Indeed, on the whole, they do not know what assumptions are or why it is important to examine them. What they have in their heads exists there like so many BBs in a bag. Whether one thought supports or follows from another, whether one thought elaborates another, exemplifies, presupposes, or contradicts another, are matters that students have not learned to think about. They have not learned to use thought to understand thought, which is another way of saying that they have not learned to use thought to gain knowledge.

Knowledge, Intellectual Discipline, and Intellectual Values

Knowledge, I have argued, must be understood as the consequence of a perfecting discipline of thought, of learning to think critically. We can take the point one step further. To perfect one's thinking, to develop intellectual discipline, one must develop intellectual values. In other words, genuine education transforms the whole person by transforming one's basic modes of thinking. Indeed, properly understood, education implies a self-moti-

vated action upon one's own thinking and a participation in the forming of one's own character. Through it we cultivate self-directedness of thought and transform our values.

Students will not develop intellectual standards that discipline their thought if they do not grasp what intellectual standards are or understand their importance. Why be clear and precise? Why probe what is heard and read to see if it is clearly understood? Why choose the exact word to say what one means? Why look for reasons and evidence to justify what one believes? Why not just do and think what comes naturally? Why not believe what one wants to believe, what one's friends believe, what is easiest to believe? Why take what happens in school seriously? Why struggle to change one's mode of thinking and believing? Why strive to become an educated person?

If we want students to gain knowledge, we must not only shape instruction so that they must think their way through the content of the course, but we must also design activities, tests, and assignments so that students think about the intellectual standards and values that underlie rational learning. Critical thinking is not just a mode of thinking about thinking; it is also a mode of apprehending and assenting to standards and values inherent in educated thought. Learning to think in any discipline is learning to discipline one's thought by standards inseparable from the values presupposed in each discipline. Every discipline is to some extent unique, but each also overlaps with other disciplines, presupposes modes of thought outside itself, is ultimately translatable into everyday language, and generates knowledge consistent with that generated by other disciplines as well as with everyday modes of knowing. Among other things, education is learning to correct and qualify what we learn in one discipline by what we learn in other disciplines and in everyday life as well. What, for example, would we do with a scientific theory that implied that ice does not float on water? What would we do with a psychological theory that implied that people do not have dreams? Correction and qualification of one discipline by another, and all disciplines by our experience, require a personal synthesis that rests heavily on the capacity to think critically for oneself.

A Definition of Critical Thinking

We can now give a definition of critical thinking that helps tie together what has been said so far, a definition that highlights three important dimensions of critical thought: (1) the perfections of thought, (2) the elements of thought, and (3) the domains of thought.

> Critical thinking is disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought. It comes in two forms. If disciplined to serve the interests of

a particular individual or group, to the exclusion of other relevant persons and groups, it is sophistic or *weak-sense critical thinking*. If disciplined to take into account the interests of diverse persons or groups, it is fairminded or *strong-sense critical thinking*.

In thinking critically we use our command of the elements of thought to adjust our thinking to the logical demands of a type or mode of thought. As we come to habitually think critically in the strong sense, we develop special traits of mind: intellectual humility, intellectual courage, intellectual perseverance, intellectual integrity, and confidence in reason. A sophistic or weak-sense critical thinker develops these traits only narrowly in accordance with egocentric and sociocentric commitments.

Now I can explain what I mean by perfections and imperfections of thought, elements of thought, domains of thought, and traits of mind. In each case I comment briefly on the significance of these dimensions. I then relate these dimensions to the process of helping students come to terms not only with the logic of their own thought but also with the logic of the disciplines that they study.

Table 1.1 lists general canons for thought; they represent legitimate concerns irrespective of the discipline or domain of thought. The development of one's mind and discipline of one's thinking with respect to the standards of perfection require extensive practice and long-term cultivation. Of course, achievement of these standards is a relative matter and often they have to be adjusted to a particular domain of thought. Precision while doing mathematics is not the same as precision while writing a poem or describing an experience. Furthermore, one perfection of thought, adequacy for purpose, may be periodically incompatible with the others.

Table 1.1. The Perfections and Imperfections of Thought

Perfections	*Imperfections*
Clarity	Unclarity
Precision	Imprecision
Specificity	Vagueness
Accuracy	Inaccuracy
Relevance	Irrelevance
Consistency	Inconsistency
Logicalness	Illogicalness
Depth	Superficiality
Completeness	Incompleteness
Significance	Triviality
Fairness	Bias
Adequacy (for purpose)	Inadequacy

Because the social world is often irrational and unjust, because people are often manipulated to act against their interests, and because skilled thought is often used to serve vested interests, those whose main purpose is to forward their selfish interests often skillfully violate the common standards for critical thinking. Successful propaganda, successful political debate, successful defense of a group's interests, or successful deception of one's enemy often requires the violation or selective application of many of the standards of perfection in Table 1.1. The perfecting of one's thought as an instrument for success in a world based on power and advantage differs from the perfecting of one's thought for the apprehension and defense of fair-minded truth. To develop one's critical thinking skills merely to the level of adequacy for social success is to develop those skills in a lower or weaker sense.

It is important to underscore the commonality of this weaker sense of critical thinking for it is dominant in the everyday world. Virtually all social groups disapprove of members who make the case for their competitors or enemies, however justified that case may be. Skillful thinking is commonly a tool in the struggle for power and advantage, not an angelic force that transcends this struggle. Only as the struggle becomes mutually destructive and it becomes advantageous for all to go beyond the one-sidedness of self or group is social ground laid for fair-mindedness of thought. No society yet in existence generally cultivates fairness of thought in its citizens.

Elements and Domains of Thought

Both sophistic and fair-minded critical thinking are skilled in comparison with uncritical thinking. The uncritical thinker is often unclear, imprecise, vague, illogical, unreflective, superficial, inconsistent, inaccurate, or trivial. Avoidance of these imperfections requires some command of the elements of thought. These include an understanding of and an ability to formulate, analyze, and assess the (1) problem or question at issue, (2) purpose or goal of the thinking, (3) frame of reference or points of view involved, (4) assumptions made, (5) central concepts and ideas involved, (6) principles or theories used, (7) evidence, data, or reasons advanced, (8) interpretations and claims made, (9) inferences, reasoning, and lines of formulated thought, and (10) implications and consequences that follow.

A focus on the nature and interrelationships of the elements of thought illuminates the logic of any particular instance of reasoning or of any domain of knowledge. First, at least one question is at issue in every instance of reasoning. Can students identify and precisely express those problems or questions, distinguishing the differences between them? All human reasoning is oriented to serve some purpose or goal. Can students clearly express their purposes or goals and adjust their thinking to serve

them? Can students analyze and critique their purposes or goals? Do students recognize the points of view or frames of reference in which they are thinking? Do they consider alternative points of view? All reasoning must start somewhere and proceed in some direction. Can students identify what they are assuming or taking for granted in their reasoning? Can they trace the implications and consequences of their reasoning? Can they identify contradictions in their thought? All reasoning uses some ideas or concepts and not others. Can students identify and analyze the most fundamental concepts in their reasoning? Can they determine, for example, whether they are using a term in keeping with established usage or modifying that usage? Most reasoning relies on principles or theories to make sense of what one is reasoning about. Can students identify the principles or theories that they are using? Can they clarify them, question them, consider alternatives, apply them precisely? Most reasoning is based on experiences, evidence, or data that are interpreted and used as the basis of inferences. Can students identify the experiences, evidence, or data that they are using or on which they are basing their reasoning? Can they identify their inferences? Can they rationally argue in favor of their inferences? Can they formulate and consider possible objections to their inferences? Finally, I emphasize again that all disciplines have a logic. Can students discuss the logic of the disciplines that they are studying? Can they identify their fundamental goals or purposes? The kind of questions that they are attempting to answer? Their basic concepts or ideas? Their basic assumptions? Their basic theories or principles? The sort of data, evidence, or experiences on which they are focusing? Whether there is fundamentally one or multiple conflicting schools of thought within the discipline? When students cannot answer these questions about a subject field, they cannot think critically within it. They have no idea how to begin to compare one field to any other, or, therefore, how to correct or qualify the results of one field in light of the results of another.

Traits of Mind

There are at least seven interdependent traits of mind we need to cultivate if we want students to become critical thinkers in the strong sense:

1. *Intellectual humility* involves awareness of the limits of one's knowledge, including sensitivity to circumstances in which one's native egocentrism is likely to function self-deceptively and sensitivity to bias and prejudice in one's viewpoint.
2. *Intellectual courage* is willingness to face and assess fairly ideas, beliefs, or viewpoints to which one has not given a serious hearing, regardless of strong negative reactions to them.

3. *Intellectual empathy* is recognition of the need to imaginatively put oneself in the place of others in order to genuinely understand them.
4. *Intellectual good faith (integrity)* is recognition of the need to be true to one's own thinking, to be consistent in the intellectual standards that one applies, and to hold one's self to the same rigorous standards of evidence and proof as those to which one holds one's antagonists.
5. *Intellectual perseverance* is willingness to pursue intellectual insights and truths despite difficulties, obstacles, and frustrations.
6. *Faith in reason* is confidence that in the long run one's own higher interests and those of humanity at large will best be served by giving the freest play to reason and by encouraging people to come to their own conclusions through development of their own rational faculties.
7. *Intellectual sense of justice* is willingness to entertain all viewpoints sympathetically and to assess them with the same intellectual standards, without reference to one's own feelings or vested interests, or the feelings or vested interests of one's friends, community, or nation.

Each of these intellectual traits is best developed while developing the others as well. Consider intellectual humility. To become aware of the limits of our knowledge, we need the courage to face our own prejudices and ignorance. To discover our own prejudices, we must empathize with and reason within points of view toward which we are hostile. And we typically must persevere over a period of time, for reasoning within a point of view against which we are biased is difficult. We will not make that effort unless we have not only a faith in reason that we will not be deceived by whatever is false or misleading in the opposing viewpoint but also an intellectual sense of justice. We must recognize an intellectual responsibility to be fair to views that we oppose. We must feel obliged to hear them in their strongest form to ensure that we are not condemning them out of ignorance or bias. At this point, we come full circle back to where we began: the need for intellectual humility.

These traits are applicable to all domains or modes of knowledge, not merely to some. Like the perfections and elements of thought with which they are intimately intertwined, the traits of mind are universally relevant. Of course, those who reason to achieve selfish ends often betray intellectual standards to gain success. Education today neglects this deep-seated problem of selfish thought. Although most students enter and leave school as essentially uncritical thinkers, some develop a range of critical thinking skills to advance selfish ends. Yet, the difference between selfish and fair-minded thought rarely becomes a significant issue in instruction. Before I go further, therefore, I want to say something more about the nature of selfish thought.

Selfish Critical Thinking, Prejudice, and Human Desire

Human action is grounded in human motives, and human motives are typically grounded in human desire and perceived interest. The goal of getting what we want and what advances our prestige, wealth, and power structures and shapes how we understand the situations and circumstances of our daily lives. We routinely categorize, make assumptions, interpret, and infer from within a viewpoint used to advance our personal ends and desires. We are, in other words, each prejudiced in our own favor. We reflexively and spontaneously gravitate to the slant on things that justifies or gratifies our desires. It is not enough to be taught to be ethical, honest, kind, generous, thoughtful, concerned with others, and respectful of human rights. We can easily construe situations so as to see selfish desire as self-defense, cruelty as discipline, domination as love, intolerance as conviction, evil as good.

The mere conscious will to do good neither removes prejudices that shape our perceptions nor eliminates the ongoing drive to form prejudices. To minimize our egocentric drives, we must develop critical thinking in a special direction. We need not only intellectual skills but intellectual character as well. Indeed, we must develop and refine our intellectual skills *as* we develop and refine our intellectual character in order to embed the skills in our character and shape our character through the skills.

People not only can but often do create the illusion of moral character in a variety of ways. For instance, we systematically confuse group mores with universal moral standards. When people act in accordance with the injunctions and taboos of their groups, they naturally feel righteous. They receive much praise in moral terms. They may even be treated as moral leaders if they act in a striking or moving fashion. For this reason, people often cannot distinguish moral from religious conformity, or demagoguery from genuine moral integrity.

Genuine moral integrity requires intellectual character, for bona fide moral decisions require thoughtful discrimination between what is ethically justified and what is merely socially approved. Group norms are typically articulated in the language of morality, and a socialized person inwardly experiences shame or guilt for violating a social taboo. In other words, what we often take to be the inner voice of conscience is merely the internalized voice of social authority—the voice of our mother and father, our teachers, and other "superiors" speaking within us.

Another common way we systematically create the illusion of morality is through egocentrically structured self-deception, the shaping and justification of self-serving perceptions and viewpoints. When engaged in such spontaneous thought, we systematically confuse our viewpoints with reality. We do not experience ourselves as selecting among a range of possible

perceptions; quite the contrary, it seems to us that we are simply observing things as they are. What is really egocentric intellectual arrogance we experience as righteous moral judgment. This leads us to see those who disagree with us as fools, dissemblers, or worse.

Since our inner voices tell us that our motives are pure and that we see things as they really are, those who set themselves against us, or threaten to impede our plans, seem the manifestation of evil. If they use violence to advance their ends, we experience their action as aggressive, as blind to human rights and simple justice. But if we use violence, it is justifiable self-defense, restoration of law and order, protection of right and justice.

Self-announced prejudice almost never exists. Prejudice almost always exists in obscured, rationalized, socially validated, functional forms. It enables people to sleep peacefully at night, even though they flagrantly abuse the rights of others during the day. It enables people to get more of what they want, or to get it more easily. It is often sanctioned with a superabundance of pomp and ceremony. It often appears as the very will of God. Unless we recognize these powerful tendencies toward selfish thought in our social institutions and in what appear to be lofty actions, we will not face squarely the problem of education.

Education, properly conceived, cultivates knowledge through higher-order thinking, a process that simultaneously cultivates traits of mind intrinsic to the standards and values presupposed by fair-mindedness. Unless we take seriously the tendency toward selfish thinking, we are apt to contribute to students' critical thinking only in the weak sense.

From Lower-Order to Higher-Order Learning

What we find together in our experience we associate in our minds. If we are frequently punished for not eating our spinach, we associate spinach with punishment. If it frequently rains in the summer, we associate rain with summertime. If our parents generally speak of black persons disparagingly, we associate negativity with black persons. People associate precision, truth, and facts with numbers, polysyllabic words with genius or education, spiked hair with hooliganism, Arabs with mindless brutality, and so on. These associations evidence the lowest and simplest kind of learning. It is effortless and automatic. But the associations are often unjustified. (What is "connected" in our experience might well be unconnected in fact, and what was "separate" in our experience might well be connected.) People can throw statistics and high-sounding words around and others will be impressed; the thought of a gentle Arab pacifist strikes many Westerners as a contradiction.

True education must go beyond association to rational scrutiny. We use logic when we try to determine objectively whether our associations have a basis in reason or fact: Does the association "make sense"? Do we

have evidence or reasons to support it? Does it "fit in" with other things that we know? For example, by studying climate, we can come to recognize that there is no necessary relationship between rain and summer. By studying human nature and paying closer attention to the black persons that we meet, we can break down our prejudiced views. By reflecting on spinach and punishment, we can readily see that there is no objective relation between them. We can figure out why the connections that we have formed through mere association do or do not make sense, do or do not stand to reason, are or are not based on sound inferences.

When we analyze the logic of things, rather than simply associate them, we raise our learning to a higher order through critical thought. We lay the foundation for educated transfer of what we learn to divergent contexts, and we begin the process of developing our capacity for rational assent. We begin to develop standards for belief. We begin to question what we read, what we hear, and what we subconsciously infer. We forge *logical* rather than simply *associative* connections. We then often say to ourselves, "Let me see, does that make sense?" We then talk our way through inferences, reminding ourselves of key things that we know as we proceed. Sometimes we devise an experiment or test of some kind or ask others for their thinking, which we then analyze and consider.

Development of the habit of logical reflection on what one learns is a key to critical thinking. Not only does this involve figuring things out for oneself, it also involves pursuing the roots of what one learns until one establishes logical foundations for it, that is, linkages between the given thing to be learned and a basic logic that one already understands. For example, when studying history, the critical thinker does not simply memorize disconnected, or even connected, names, facts, and dates. Nor is it enough to reflect on alternative historical explanations. One also must reflect on the logic of historical thought. What is it to think historically? To what extent is historical thinking a dimension of all of our thinking about the world? To what extent, in other words, is all human thinking historical? Such reflection need not be esoteric and distracting. Indeed, it is eminently practical to recognize that everything learned is temporally sequenced by the mind, that we continually see the present in light of the way that we see the past, that we have internalized a selective memory of what has happened to us, and that our way of interpreting and organizing the past is only one of many such ways of structuring it.

When we grasp that all humans shape their present by their reading of their past and their anticipation of the future in the light of the past, we come to terms with the logic of history. We then approach not only all historical texts but also all interpretations of experience with the realization that each record or interpretation of the past is selective, presupposes value judgments about what is important, and organizes information within one out of a number of rationally defensible frames of reference or points of view.

To develop their sense of the logic of history, students must read history books as historians read them, asking questions such as What is left out? What is thrown into the background, what into the foreground? How are events conceptualized? What point of view informs the text? What assumptions are made? What implications does this reading of history have for our interpretation of the present? These questions presuppose awareness of the elements of thought. By raising questions while reading or writing history, students develop their own historical thoughts, judgments, and knowledge. They leave with something much richer and more valuable than the usual scattering of memorized dates, names, and accounts, bits and pieces of others' historical thoughts.

A questioning attitude and spirit is what we want to cultivate in our students. But how can we do so? The answer is that we must develop not only teaching strategies for the individual professor but departmental and collegewide teaching strategies as well.

Teach for Critical Thinking

As one who has designed four books on the infusion of critical thinking into school curricula, one for kindergarten through third grade, one for fourth through sixth grades, one for sixth through ninth grades, and one for ninth through twelfth grades, I am amazed when educators suggest that their students are incapable of thinking critically. I, and teachers with whom I have worked, have been able to successfully remodel standard lessons of kindergarten through high school to infuse critical thinking principles.

Unfortunately, many educators feel that they do not have time to focus on the critical thinking of their students. They feel that their primary responsibility is to "cover" subject matter in didactic lectures. The students' first responsibility, they reason, is to demonstrate that they can articulate what the lectures and textbooks contain. This recitation of material takes up most of the available class time. Beyond this, many educators reason, it is the students' responsibility to fully internalize and think through the problems of the discipline.

Remember, until graduate school, most educators did not experience teaching that called upon them to significantly develop their own thinking. Furthermore, many have large classes of passive students with little motivation to learn. Many instructors lack interest in any subjects but those that they teach and are suspicious of any attempt to get them to consider objectives that go beyond the content that they usually teach. The didactic mindset of most educators dovetails perfectly with the passive "tell-me-what-is-important-so-I-can-tell-it-back-to-you-on-tests-and-papers" attitude of most students. Most students are totally unprepared for assignments requiring them to think critically. They assume that one way or another either the textbook or the professor will tell them what to say or do. Hence,

even when the professor believes that critical thinking is required, most students will not produce it simply because they do not know how.

Educators, then, must redesign their instruction in ways that parallel the efforts of elementary and secondary teachers interested in critical thinking. A wide variety of strategies can be used. Most cannot be covered here. Nevertheless, several general tactical recommendations can be made for college course design:

1. *Assess the amount of content as well as the way that content is covered.* Remember that there is more than one way to cover any given domain. As little as possible should be spoon-fed to students in lectures. The student's capacity to reason should be used as a tool of coverage as much as possible. In a history class, for example, the time ordinarily allocated to lecture on the Revolutionary War could instead be used by having students research different interpretations of the war and argue for them. Students might then write a dialogue between two imaginary historians, arguing for different views of the war. Here, critical thinking requires not only that the students gather evidence and data but also that they learn how data are selected, shaped, organized, and integrated into a historical perspective. The bottom line is that coverage should be designed so that students think their way through the material.

2. *Analyze the logic of what is taught.* We should always teach with a clear conception of the most basic goals and purposes behind what we cover, its basic issues, basic concepts, basic assumptions, and basic modes of analysis. Then, we should continually stimulate our students to relate what they learn to those basics. It is not enough for educators to implicitly know the logic of their disciplines. They must also explicitly analyze them and design activities and assignments that continually force the students to move back and forth inferentially from basic concepts, assumptions, principles, theories, and data, to derivative concepts, standard and novel applications, reasoned conclusions, and constructed interpretations.

Educators could ask themselves what those who work in their disciplines actually do, where they start, how they approach their subjects, how they correct their own thoughts, how they gather and assess information, and so on. Then, instruction could be designed that parallels those processes. Ask what the well-educated person does with knowledge in the subject and then create similar tasks for students. This approach is possible in all disciplines.

3. *As often as possible use cooperative learning as a teaching tool.* Most people learn more easily when they have to articulate what they are learning to others. Unlimited activities and assignments can be structured, both inside and outside of class, so that students articulate, explain, use, organize, justify, and extend basic concepts, assumptions, data and evidence, problems and issues, theories and principles, and all other fundamental elements within the logic of what they are learning.

4. *Let the students' level of knowledge, perceptions and misperceptions, and attitudes determine the starting point.* Discover and analyze and then address students' current thoughts regarding the field. Begin each topic by having students tell or write about what they know or think about it. Discussion of students' prior knowledge and misconceptions increases their ability to take in new ideas, compare them to their original thoughts, and so change their beliefs, rather than merely superimpose the new on the old. Construct activities that pit students' misconceptions against well-established knowledge of the subject to allow students to discover for themselves why they should abandon their misconceptions.

5. *Speak less so that students think more.* Try not to lecture more than 20 percent of total class time. Periodically pause during lectures and have pairs of students reconstruct important ideas covered, or think of one application of the ideas covered, or question each other on the assumptions or implications of the lecture thus far.

6. *Do not be a mother robin,* chewing up the text for the students and putting it into their beaks through lecture! Teach them instead how to read the text for themselves, actively and analytically. Focus, in other words, on how to read the text, not on "reading the text for them."

7. *Focus on fundamental, and powerful, concepts with high generalizability.* Do not cover more than fifty basic concepts in any one course. Instead of introducing more concepts, apply and analyze the basic concepts while engaged in problem solving and reasoned application.

8. *Present concepts, as far as possible, in the context of their use as functional tools* for the solution of real problems and the analysis of significant issues.

9. *Develop specific strategies for cultivating critical reading, writing, speaking, and listening.* Assume that students enter the class with limited skills—as indeed they do—in these essential learning modalities.

10. *Think aloud in front of the students.* It is instructive for students to hear their professors thinking or, better, *puzzling* their way slowly through problems in the subject. Try to think aloud at the level of a good student, not as a speedy professional. If the thinking is too advanced or proceeds too quickly, students will not be able to internalize it.

11. *Regularly question the students Socratically,* probing various dimensions of their thinking: their purposes; their evidence, reasons, and data; their claims, beliefs, interpretations, deductions, and conclusions; the implications and consequences of their thought; their responses to alternative thinking from contrasting points of view; and so on.

12. *Call frequently on students who do not have their hands up.* Then, when one student says something, call on other students to summarize in their own words what the first student said (so that they actively listen to each other).

13. *Use concrete examples whenever possible to illustrate abstract concepts*

and thinking. Cite experiences that are more or less common in the lives of the students (relevant to what is being taught).

14. *Require regular writing for class.* But, given limited time, grade using random sampling in order to assess their writing without having to read it all. It is a good idea to require a short written assignment for each class meeting, something that requires analysis and synthesis of what was covered in the previous class. By exchanging papers in class, having some students read their work aloud, then discussing criteria for assessing them, the students can give each other feedback. Each student can be required to keep all papers in a file. Five files a week can be collected, and one or two papers from each file can be graded. Thus, students can actively think their way through the logic of the subject, without the professor having to grade an exceptionally large number of papers. By writing for their peers, students begin to see why they must express themselves clearly and support their conclusions with reasons and evidence.

15. *Spell out explicitly the intellectual standards of the system of grading.* Teach the students how to assess their own work using those standards.

16. *In general, design all activities and assignments, including readings, so that students must think their way through them.* Lead discussions on the kind of thinking that is required.

17. *Keep the logic of the most basic concepts in the foreground,* continually reweaving new concepts into the basic ones. Talk about the whole in relation to the parts and the parts in relation to the whole.

18. *Let students know what they are in for.* On the first day of class, spell out as completely as possible one's philosophy of education, how and why the class is structured in a certain way, why the students will be required to think their way through it, why standard methods of rote memorization will not work, the counterstrategies to be employed in order to combat their strategies for passing classes without much thinking, and so on.

Build a Sound General Education Program

While individual courses are being restructured, the general education program should also be assessed. General education courses should not merely transmit information but require significant amounts of critical reading, writing, speaking, and listening. In these courses, more so perhaps than in others, educators should do more than lecture. They must ask probing questions, stimulate students to think independently, listen carefully to what students say, discuss reasons and evidence, draw out implications and assumptions, seek examples, analogies, interdisciplinary connections, and objections, and raise and reason within multiple points of view. They must be willing to play the devil's advocate. They must design classes so that students actively interact with each other as well as

with the professor and text. They must set out definite intellectual standards that students can use to assess their own work. They must establish means to verify that students do indeed assess their own work. Critical writing and thinking are a natural pair, and more college and university systems should articulate general education requirements that accentuate this pairing across the curriculum.

Adopt a Campuswide Statement on Educational Goals Focused on Critical Thinking

All colleges and universities should adopt fundamental goals statements that highlight critical thinking and lay the foundations for discipline-specific statements from individual academic departments. Consider the following possible statement:

> All students are expected to take responsibility for their own learning. This means that students are expected to learn the art of independent study and develop sound intellectual habits and skills. All work should reflect care, thoroughness, and precision; should reveal command of the processes of critical reading, writing, speaking, and listening; and should demonstrate independent critical thought. Students should not approach their classes as so many unconnected fields, each with a mass of information to be blindly memorized, but rather as organized systems for thinking clearly, accurately, and precisely about interconnected domains of human life and experience. In science classes, students should learn to think scientifically, in math classes to think mathematically, in history classes to think historically, and so on, in such a way that, when later called upon to respond to a problem or issue in one of these domains, students will know how to begin to interpret and analyze it, to seek and organize information appropriate to it, to reason well concerning it, and to devise a clear and reasonable way to find an appropriate answer or solution with respect to it. To develop into disciplined and independent critical thinkers and learners, all students should be actively involved in their own learning, looking to find in each of their classes the most basic ideas, principles, and meanings and to use these as a basis for analyzing, synthesizing, and assessing all of the remaining information or content covered.

The History Department, for example, might begin its statement with something like the following: "Each history course has the goal of helping students learn how to think historically and think *about* history critically and insightfully. Students should learn how to identify historical viewpoints, gather and organize historical information, distinguish basic historical facts from interpretations, recognize historical relationships and patterns, and

see the relevance of historical insight to the understanding of current events and problems."

Establish Critical Thinking Courses

Unfortunately, many educators uncritically assume that they must choose between establishing core critical thinking courses and integrating critical thinking across the disciplines. This is like assuming that we must choose between composition courses, on the one hand, and the teaching of writing across the curriculum, on the other. Reason favors a "both-and" rather than an "either-or" approach to both of these issues. In this case we can have our cake and eat it too.

Over one hundred textbooks published in the last twenty-five years qualify as candidates for use in a basic critical thinking course. Faculty should scrutinize them carefully and use them judiciously. Some of the texts overemphasize formal logic, which does not easily transfer to practical application, at least not as usually taught. Furthermore, many, if not all, textbooks in critical thinking have more content than the average student has time to think through. As in every other course, instructors must resist the temptation to cover more than students can deeply grasp.

Conclusion

If educators can be persuaded that students can and should think their way through the content of their courses, can and should gain some grasp of the logic of what they study, can and should develop explicit intellectual standards, then they can find many ways to move instruction in this direction. Some ways represent new kinds of assignments and activities, some represent new modes of assessment, some represent new ways to structure general education programs, some represent new ways to create collegewide commitments, and some represent new ways to conceive departmental goals and objectives.

The question is not whether there are ways to articulate clearly the *what*, *why*, and *how* of critical thinking but whether people will commit themselves to the process of reform. The California state college and university system as well as the California community college system have both taken significant steps in this direction. Nevertheless, many colleges and universities in these systems have ignored the spirit of new requirements in critical thinking. Complacency, apathy, even arrogance are often found among college and university faculty and administration, just as they are often found among college and university students. I hasten to add, however, that as poorly as students are prepared for college—and they are miserably prepared—it is not primarily students but educators who impede the introduction of critical thinking into college and university classes.

One can design any class so that students must think their way

through the content. One cannot, however, compel faculty to design their classes in this way. One cannot compel faculty to reassess their teaching styles. One cannot compel faculty to lecture less and question more. One cannot compel faculty to think critically about their own instruction.

Accordingly, reform of higher education will take place only over an extended period of time. Those committed to critical thinking must help those who are most receptive to it. Interested faculty must work with other interested faculty. Interested administrators must work with and support interested faculty. More teams of faculty must be funded to participate in critical thinking conferences. Vanguard institutions must share experiences and programs. An increasing number of steps must be taken to publicize both faculty and colleges that have made significant progress on this front.

Future research will never "discover" that it is unimportant for students to think critically or that knowledge is nothing more than recall, or that didactic lectures do, after all, produce higher-order thinking in students. Resnick (1987) has summarized higher-order thinking as nonalgorithmic, complex, and often yielding multiple solutions. It involves nuanced judgment and interpretation, the application of multiple criteria that sometimes conflict with one another, frequent uncertainty, self-regulation of the thinking process, and the imposition of meaning. Higher-order thinking is *effortful.*

Assignments that make students think their own way through the logic of the content call upon them to think in a higher-order fashion virtually every step along the way. There are no algorithms for doing one's own thinking. Critical thinking by its very nature is principled thinking, not procedural thinking. Critical thinking requires the thinker to continually monitor his or her thought with questions that test for clarity, accuracy, specificity, and so on. Since critical thinking often requires thinking within multiple points of view and frames of reference, it often yields multiple possible solutions. Since critical thinking enables a person to achieve genuine knowledge rather than mere recall, and since what is learned must always be integrated into the personal experience and previous knowledge of the thinker, it always involves the imposition of meaning.

Research on critical thinking is converging. The elements of the problem and its solution are increasingly clear and well-defined. The obstacles are predictable and understandable. The fundamental questions that remain are in part rhetorical. How many generations will it take to shift instruction from didactic to critical thought? How long before students at every level of schooling will have their thinking stimulated rather than discouraged or deadened? What is the point of schooling that fails to prepare students for the world in which they have to live?

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RICHARD PAUL is director of the Center for Critical Thinking and Moral Critique, Sonoma State University, Rohnert Park, California.

By using an interdisciplinary approach to the teaching of critical thinking, educators as well as students can become lifelong learners who are active participants in their own educations.

Teaching Critical Thinking Across the Curriculum

John Chaffee

Traditionally, higher education is thought to produce literate and sophisticated thinkers, equipped with the knowledge and intellectual abilities needed to be informed citizens and successes in their chosen careers. Yet, in a modern-day reenactment of the "Emperor's New Clothes," there is a growing awareness that many students are not actually leaving college clothed with the literacy, intellectual understanding, and depth of insight supposedly symbolized by the degrees that they have earned. The need for higher education to foster the development of these sophisticated thinking abilities in mainstream college courses is thus emerging as a problem of national significance. While academically successful students are typically able to absorb information, memorize facts, and learn fixed procedures, they often experience profound difficulties in thinking critically and creatively about what they are learning.

As a result, one of the most common complaints by faculty in college-level courses, as well as by employers, is that students cannot think effectively. "Thinking" in this context generally refers to a variety of complex, cognitive activities such as solving problems, generating and organizing ideas, forming and applying concepts, designing systematic plans of action, constructing and evaluating arguments, exploring issues from multiple perspectives, applying knowledge to new situations, critically evaluating the logic and validity of information, developing evidence to support views, carefully analyzing situations, and discussing subjects in an organized way.

Although these critical thinking abilities are clearly needed for academic study and career preparation, and even though teachers aspire to teach critical thinking as an educational ideal, critical thinking is rarely taught explicitly

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and systematically. For example, numerous empirical studies have revealed that teaching behavior in most high school and college classrooms tends to focus on the lowest cognitive level of knowledge, the dispensing of facts, at the expense of higher intellectual operations such as application, analysis, synthesis, and evaluation. Recent examples of this research include Sirotnik (1983), Fischer and Grant (1983), and Nickerson, Perkins, and Smith (1985).

Let's briefly examine two contrasting models of teaching and learning: the coverage model and the critical thinking model.

Coverage Model

There is a trend in colleges to view education as the transfer of information from teacher to student. For teachers operating under this model, the primary responsibility is to cover content rather than encourage students to think about and critically evaluate what they are learning. This information transfer perspective has been described in various ways, ranging from the high-technology data bank metaphor (students are blank disks waiting to be programmed) to the more earthy feedlot metaphor (students are emaciated cattle who graduate when they reach a certain weight).

The coverage model is encouraged and supported by the academic system as a whole. It is the way that most faculty were educated, it provides clear criteria of student mastery that can be easily evaluated, and it serves to define the structure of curricula and the rigor of courses. Under this model, teachers present complex bodies of information through readings and lectures, while students develop and refine the abilities needed to master large amounts of information and to re-present this information on examinations. Faculty are thus viewed as sources of knowledge and arbiters of correct answers, while students are seen as relatively passive receptacles into which knowledge is poured. As a result, the information transfer model does not stimulate or assist students in the development of the critical thinking skills and higher-order intellectual abilities needed in the world beyond coursework and college.

Critical Thinking Model

In contrast to the coverage model, the critical thinking model purports that students should not merely master information but should also develop a progressive understanding of the process used in each discipline to generate and think about information. For example, from this perspective, instead of focusing on the presentation of the facts and theories of history, the role of faculty is to introduce students to the ways that historians think about and perceive the world, a perspective that leads to construction of historical information and analysis of the historical process. A critical thinking approach in history emphasizes the intellectual skills used to evaluate the reliability and accuracy of eyewitnesses, of observation, and of sources

of information in constructing our "knowledge" of historical events. When taught in this way, students come to realize that each discipline is not simply a repository of accumulated knowledge but instead a dynamic, creative thinking activity—a structure of concepts and methodologies used to organize experience, approach problems, and give explanations. By learning to "think" in these different ways—historically, philosophically, scientifically, and so on—students learn new ways of viewing their world and of developing their intellectual abilities.

Many faculty are concerned that if they use a critical thinking approach to teaching, their students will not acquire enough knowledge. However, faculty are not really forced to make a choice between knowledge and critical thinking. In fact, both educational aims are more effectively achieved when they are pursued together. When we are stimulated to actively think about a particular subject, we learn more effectively and our learning is more lasting because we have organized and constructed it ourselves. In contrast, when we are merely trying to passively absorb information structured by others, our retention often does not extend far beyond the end of a course's final examination. The underlying aim of the critical thinking approach to education is to create independent learners who will share the responsibility for learning and continue on a lifelong journey of exploration and discovery.

Critical Thinking at LaGuardia Community College

The critical thinking program at LaGuardia began ten years ago with the development of its keystone course, Critical Thought Skills (CTS), which was created to explore cognitive processes and to provide entering students with the higher-order thinking and literacy abilities needed for academic and career success. Fueled by two grants from the National Endowment for the Humanities (NEH), that initial seed has developed into an interdisciplinary program that annually involves over eight hundred students, taught by faculty from a wide variety of disciplines. CTS has three basic aims: (1) Enhance and accelerate the development of students' reading, writing, and speaking skills. (2) Develop and refine students' higher-order thinking, reasoning, and problem-solving abilities. (3) Encourage students to explore their basic attitudes toward their lives and larger social concerns, fostering qualities such as maturity and responsibility.

The curriculum is described in my text, *Thinking Critically 3/E* (Chaffee, 1991), which grew out of the collaborative efforts of those involved in the program. Since the course is an elective, its growth to over forty sections annually can be seen as one indication of the significant contribution that LaGuardia makes to the lives of its students, as expressed in the following student quotation: "The words *critical thinking* will never leave my vocabulary because by learning how to organize my ideas, support my

point of view with reasons, and trying to solve my problems rationally, I have learned more effective ways of dealing with my life, my children, and my schoolwork."

Of course, any one course in critical thinking will have a limited impact on students' modes of thought unless the same abilities are reinforced in the other courses that they take. At LaGuardia, our efforts to accomplish this goal of infusing critical thinking across the curriculum have been funded by four years of NEH support. The project is structured around course "pairs," in which a section of CTS is joined with another course selected from a variety of academic areas. Students enrolled in a course pair have to take both courses, providing a vehicle for integration of the course material and reinforcement of intellectual abilities. These course pairs, in concert with weekly faculty meetings, give faculty the opportunity and guidance to redesign their courses and refine their teaching methodology with the aim of fostering critical thinking abilities.

Program Evaluation

The critical thinking program has been subjected to in-depth evaluation, detailed in Chaffee (1985) and available by writing to LaGuardia. It has been characterized by the Educational Testing Service as "a mature educational program which has involved and succeeded with a wide spectrum of students" (Chaffee, 1985, p. 57) and evaluated by NEH in official correspondence (March 16, 1986) as "a very enlightened approach to undergraduate instruction." In general, the program appears to have succeeded in meeting its three primary objectives: literacy, reasoning and problem solving, and critical attitudes.

Literacy. Since language and thinking are closely related, reciprocal, and interactive processes, the LaGuardia program is designed to improve students' thinking abilities while simultaneously enhancing their language skills. The cumulative results of the program have revealed that students enrolled in CTS pairs have consistently demonstrated accelerated development of language skills as measured by standard writing and reading examinations. In fact, the students in these course pairs have nearly doubled the schoolwide average on these standardized measures over the past seven years. In addition to improvements in students' structural language skills, faculty also report that students are learning to use language with a depth, insight, and sophistication unusual for students at the community college level as they seek to utilize and express their evolving higher-order thinking abilities.

Reasoning and Problem Solving. Utilizing a variety of evaluation strategies, the major evaluator of the project, Garlie Forehand, director of research at the Educational Testing Service, concluded that the program fosters the development of students' thinking abilities at both general and

specific levels. He states, "At the general level, teachers perceive more respect for the thinking process, more tendency to bring a 'habit of thinking' to their classes. At the specific level, teachers reported instances of transfer of such skills as breaking problems into parts, classifying, organization of thought, asking questions, separating facts from opinions, and assessing alternative points of view" (Chaffee, 1985, p. 50). Students also recognized the development and transfer of thinking skills from CTS to other content courses, citing examples such as breaking mathematics problems into parts and applying insights about perspective taking to the concept of ethnocentrism in social science. Since fundamental thinking abilities and critical attitudes work together and interact in complex ways, students do not learn them in a skill-by-skill fashion. Instead, in accord with developmental theory and faculty analyses, students in the program are undergoing a developmental process in which skills, attitudes, and perceptions are progressively reorganized into new cognitive patterns. This reorganization leads to breakthrough or "aha" experiences as students discover new methods and abilities, revealed in student comments such as the following: "It expands thinking, like a tool." "Part of my brain awakened." "It put a seed, a spark, in me."

Critical Attitudes. One of the guiding principles of the critical thinking program is that learning should take place in an experiential context, serving to stimulate qualities such as self-awareness, initiative, and maturity. As Forehand noted, faculty reported that students displayed this sort of affective development by being more attentive, less likely to be absent, more quick to follow instructions, more serious about coursework, more adept at asking questions and verbalizing, less afraid of thinking and expressing themselves, and more self-confident. Or, as one professor stated, "Maybe *maturity* is the word." A mathematics professor, Elizabeth Spicer, observed that "the affective effects are unmistakable—students are not only less likely to 'give up,' perhaps on the basis of increased self-esteem, perhaps now that they possess thinking strategies and see themselves more as analytical thinkers. They also are willing to 'tax their brains,' perhaps because they are simply more accustomed to doing so" (Chaffee, 1985, p. 28).

Critical Thinking Models: Teaching Versus Infusing

One of the current controversies in education is whether critical thinking skills should be taught directly in courses such as LaGuardia's CTS, or whether these skills should be developed as part of the regular curriculum by integrating them into the disciplines. Certainly, the infusion of critical thinking across the curriculum is a necessary, and desirable, objective. College faculty can be guided in the redesign of their teaching approaches so that students develop critical thinking abilities while mastering course

content. However, because of the complexity of the various disciplines and the amount of material covered in courses as they are now constructed, it is unrealistic to expect faculty to focus specifically on thinking processes while simultaneously teaching their disciplines.

As a consequence, just as the need for freshman composition courses has not been eliminated by the writing-across-the-curriculum movement, so there is a need to teach cognitive abilities directly in the form of critical thinking courses. In general, students need a direct, in-depth opportunity to understand and systematically develop these sophisticated thinking abilities early in their academic careers so that they can use these abilities to successfully negotiate and appreciate the complexity of their disciplinary studies. Unless we focus on these thinking processes and abilities in a discrete course, students will not develop them to the fullest extent possible. Additional reasons for providing critical thinking courses include the following: (1) Critical and creative thinking has evolved in recent years into a distinct field of study, a multidisciplinary initiative focused on cognitive processing and strategies for improving the effectiveness of people's thinking abilities. The field has spawned numerous books and articles, research studies, evaluation instruments, conferences, professional societies, and advanced degree programs. As such, it is an appropriate subject for study in academic courses. (2) There is persuasive evidence that a well-designed, effectively taught course in critical thinking can accelerate the development of students' higher-order thinking and literacy abilities. Examples of this research include Chance (1986), Lochhead and Clement (1979), Schonfeld (1987), and Chaffee (1985).

Of course, care must be taken in designing and teaching thinking skills courses. For example, these skills cannot be taught in isolation; they must be applied in a variety of contexts in order to facilitate transfer of these abilities to life situations as well as academic coursework. In addition, intellectual skills must be taught in ways that foster active, long-lasting learning.

Guidelines for Integrating Critical Thinking

Although many college faculty agree with the general aims of the critical thinking model, difficulties often arise when these general aims are translated into specific strategies and activities. There is a very large and rapidly expanding literature on critical thinking and intellectual development. In this section, some of the major themes in this literature are presented as guidelines in the reconceptualization of courses for enhancement of students' critical thinking abilities.

1. *Articulate the critical thinking aims for the course.* The objectives of academic courses are typically defined in terms of the content to be covered or behavioral skills to be mastered, and this emphasis is expressed in

course structure and evaluative measures. In order to foster critical thinking, it is important to specify the thinking and conceptual abilities that students are expected to develop in various aspects of the course as well as in the course as a whole; once these goals are identified, faculty are then in a position to design activities and employ teaching strategies that foster the development of the abilities.

2. *Stimulate active learning.* Active learning lies at the heart of effective, lasting education. Strategies that stimulate an active discovery approach to learning include interactive teaching, which encourages student questioning and participation; collaborative group work based on peer analysis and evaluation; student-led discussions that dialogically explore key concepts; projects that stimulate students to develop and test hypotheses based on their new knowledge and to generalize to new situations and evaluate the underlying reasoning; and exchanges in which students articulate their thinking and reasoning and receive feedback in order to encourage awareness of their cognitive processes. These and other approaches encourage students to become actively involved in the construction of their own understanding of the world and to share the responsibility for their learning.

3. *Encourage well-supported conclusions.* Everybody has beliefs. What distinguishes sophisticated thinkers is that their conclusions are informed, supported by reasons and evidence. In much of college study, there is an inordinate emphasis on the "correct answer," embodied, for example, in the widespread use of objective tests. The fact is that the reasoning used to reach conclusions is often more interesting than the conclusions themselves, and it is the effectiveness of this reasoning process that often helps determine our career and life success.

4. *Encourage perspective taking.* All individuals are involved in the process of constructing their own understanding of the world as they actively select, organize, and interpret their experiences in order to decide what to believe, feel, and do. All aspects of this interactive process are shaped by our individualized "spectacles"—values, interests, biases, predispositions—that influence what we perceive, how we process information, and how we decide to act. Critical thinking involves awareness of our own "spectacles" (and those of others) through examination of various viewpoints on issues and situations. As a result, critical thinkers strive not only to support their views with reasons and evidence but also to think empathetically within points of view or frames of reference with which they disagree and to understand the reasons that support these alternative perspectives. In order for students to develop these abilities, faculty must introduce multiple viewpoints, ambiguity, and disagreement among authorities. In addition, they must encourage students to be open to other views and new ideas and flexible enough to modify ideas in light of new information or better insights. For example, examination of a variety of diverse historical accounts regarding the Vietnam War leads to an appreciation of the com-

plexity of the issues involved and the reasons for conflicting interpretations.

5. *Stimulate thinking and language use at all cognitive levels.* Benjamin Bloom (1956) identified a variety of ways that people organize and interpret information, ranging from relatively simple levels (knowledge, comprehension) to more complex levels (application, analysis, synthesis, evaluation). As noted earlier, research shows that most secondary school and college teaching focuses on the simpler cognitive levels, knowledge and comprehension. However, if students are to develop sophisticated higher-order thinking abilities, they must be challenged with activities, questions, and teaching approaches that stimulate multiple levels of cognitive functioning.

6. *Promote critical literacy.* The development of our thinking abilities is closely tied to the development of our language abilities. This mutual influence is due to the interwoven and reciprocal relations between thinking and language. Although colleges have traditionally been committed to the goal of developing articulate and literate thinkers, writers, speakers, and readers, a review of typical college courses and textbooks reveals an absence of critical literacy. Many examinations are objective, giving students little opportunity to express their thinking in a systematic and developed fashion. Much of the required reading is assigned mainly for the transfer of information, not the critical evaluation of the ideas presented. Many of the classes are cast primarily in a lecture format, reinforcing the notion that students are passive receptacles into which information is transmitted, not thinkers who can question, reflect, and exchange ideas with others. If students are to develop these sophisticated linguistic and cognitive abilities, they must have consistent opportunities to complete substantive writing assignments, critically evaluate challenging readings, and discuss ideas thoughtfully and systematically with other members of the class.

7. *Build from students' experience.* Effective learning requires students to relate what they are learning to their own experiences, building systematically from their concrete familiar contexts to more abstract, conceptual understandings. One of the key insights of modern cognitive psychology is that we create explanations and solve problems in ways that are consistent with our ways of thinking, and unless instruction is somehow "matched" to the students' ways of making meaning out of reality, the students will learn little. If we merely try to transfer our knowledge and insights, oblivious to the students' contexts and ways of thinking, then much of their "learning" will be rote, involving memorization of key facts and manipulation of bits of information that have no coherent or lasting meaning to them. A more effective approach is to enable students to gradually expand their frames of reference, building on what they know by systematically integrating new information into their frameworks of meaning. For example, if we are teaching students strategies for problem solving, we might begin by having them solve problems from their own experience before moving on to more abstract, less personalized contexts. This approach gives them the oppor-

tunity to internalize the problem-solving methodology that is being developed. Once internalized, this way of thinking becomes an ongoing part of the way that students make sense of the world and equips them to move on progressively to more abstract applications.

Teaching Critical Thinking Through Professional Development

In the final analysis, students cannot rise any higher than the people who are there to teach and inspire them. In order for students to develop their critical and creative thinking abilities, they must be taught by faculty who are themselves critical and creative thinkers, who embody and stimulate these qualities in every phase of their teaching. What is the best way to stimulate the professional development of faculty who are entrenched in very traditional modes of thinking and teaching? Foremost, it is clear that we must pursue an organic model of professional growth in which faculty are active, creative participants in the process. Any attempt to externally apply rigid models or use a cookbook of thinking strategies will have little real impact on faculty teaching styles or student learning styles. The most effective strategy for drawing faculty into a critical analysis of their teaching depends on the specific context, but there are key factors relevant to the success of such efforts, including the following:

Curriculum. A meaningful infusion of thinking abilities requires, as the centerpiece, a curriculum structure that makes explicit the concepts and abilities to be taught, integrated, and reinforced. The curriculum acts as a point of reference, a focus for collaboration, a benchmark for self-evaluation, and a vehicle for communication. Projects lacking such a structure tend to collapse into chaos and confusion. In the critical thinking program at LaGuardia Community College, *Thinking Critically 3/E* (Chaffee, 1991) serves as the unifying structure, implemented through the course pairings described earlier. At the same time, the perspective embodied in the text is enriched and expanded by the faculty participating in the project.

Faculty Collaboration. Faculty who participate in critical thinking projects must have the opportunity to collaborate regularly so as to share and critically examine their teaching experiences and reflect on the process in which they are engaged. This process of sharing intellectual tasks, providing mutual support, and seeing the success of one's efforts is personally and professionally rewarding. At LaGuardia, faculty who were involved in the NEH-funded project met weekly, developed materials for the implementation of their ideas, and concluded the project with an analytical report that examined and evaluated their experience. These seminar-like encounters enabled the faculty to expand their thinking by examining, under careful scrutiny of peers, their own tentative judgments about various teaching approaches.

Faculty Ownership. It is important to emphasize that the goal of critical thinking projects is for faculty to absorb a perspective on teaching and learning and then creatively incorporate this perspective into their teaching. In short, we are asking them to think critically as they reconceptualize the structure of their courses and enhance their teaching methodologies. For example, in the LaGuardia program, faculty from the same subject areas are able to reshape the same course in individually innovative—yet equally valid—ways that reflect each person's unique talents and creative ideas.

Teaching the Whole Student. There is a growing recognition that effective education must address the whole student: the writer, not just the writing; the thinker, not just the thoughts. In order for students to develop the self-insight and motivation required for meaningful intellectual development, they must be encouraged to relate their educational experiences to their goals, their values, and their self-concepts.

The Harvard educator William Perry (1970) has provided an articulate analysis of students' personal and intellectual growth. He distinguishes a number of coherent interpretative frameworks through which students give meaning to their educational experiences. This odyssey begins in what he terms the Garden of Eden, in which the instructor is perceived as absolute authority, the source of truth and arbiter of correct answers. The journey continues through a relativistic phase of uncertainty in which all views are considered equally valid, and it culminates with what we might term a *critical epistemology*. In this final stage, knowledge is seen as contextual, not absolute. Some ways of viewing the world are superior to others, but evaluation judgments are always made within a context and must be properly supported by appropriate reasons and evidence. From this vantage point, knowledge is seen as a human construction, an ongoing process of exploration and discovery that involves personal commitment and responsibility.

The task of teaching the whole student thus involves an interweaving of critical thinking abilities and the students' experiences, based on the expectation that the abilities that students learn in this fashion become a part of who they are, how they perceive their world, how they experience themselves and others, and how they understand the contexts within which their choices and decisions are made. This view is based on the conviction that thinking skills are best taught through a process of synthesis, giving students the means to clarify and make sense of themselves and the world in which they live.

By seeking to foster the meaningful development of our students' intellectual abilities, we are seeking to equip them with the tools that they will need to construct stairways to their dreams. It is difficult to conceive of a more worthy educational enterprise.

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JOHN CHAFFEE is director of creative and critical thinking studies at LaGuardia Community College, Long Island City, New York.

Critical thinking ability can be assessed in the classroom by attending to principles of assessment.

Assessing Critical Thinking

Lucy S. Cromwell

In this age of accountability, the questions of what students are learning and how we can be sure that they are learning must be uppermost in the minds of all educators. For community colleges, these questions are part of ongoing attempts to define and develop programs that ensure that students are indeed achieving the goals of their institutions. With the current emphasis on critical thinking across the country, we can condense the broader questions about learning into the following: How can educators assess student development of critical thinking? In this chapter I consider critical thinking and assessment with the aim of suggesting ways that community college educators can work within the structures of their institutions to ensure that assessment occurs and that student learning improves. Based on the experiences at Alverno College with ability-based education and assessment, I suggest principles, illustrated with examples, that help ensure that students do indeed think critically.

At a recent conference for community colleges in Michigan, I polled over one hundred educators to see what they felt were the greatest needs regarding critical thinking at their institutions. Everyone agreed on the importance of critical thinking as a goal. Some of the obstacles mentioned were lack of good models in their own educations, heavy faculty teaching load, overuse of multiple-choice tests, too much stress on memory and definitions, vague sense of the meaning of critical thinking, and apprehension about teachability and assessability of critical thinking. Some of the specific statements of need were also illuminating: need for a climate to encourage critical thinking across the institution, need for common faculty goals and programs for teaching and assessing critical thinking, and need to learn how to incorporate critical thinking into other course objectives. One educator summarized the situation by stating that all faculty need to

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incorporate the critical thinking process in every classroom and to develop assessment instruments to check on students' abilities to think critically. I find that these expressions are representative of community college concerns. As we consider how to assess it, we also must ask what is this sometimes vague but obviously significant ability of critical thinking?

Definition of Critical Thinking

The standard definition of critical thinking has shifted from the ability to recognize certain patterns of thought in the work of others to the more active demonstration of critical thinking of one's own. Ennis's definitions of critical thinking over the years show this change in emphasis: from "correct assessment of statements" (1962, p. 83) to "reasonable, reflective thinking that is focused on deciding what to believe or do" (1981, p. 143). Ennis's revision might have been in response to criticism of the limited scope of his first definition (McPeck, 1981), but it is surely also in response to a shift toward active statements of educational outcomes. A student's ability to assess *another's* critical thinking as expressed in statements is thus transformed into the student's ability to do his or her own reasonable, reflective thinking.

Nickerson, Perkins, and Smith (1985) survey the field of critical thinking to define and suggest ways to teach it. Like Ennis, they propose an active definition: "Clearly, figuring out what to believe, in a wide variety of contexts, is an especially important aspect of modern life. And to do that in a rational way requires the ability to judge the plausibility of specific assertions, to weigh evidence, to assess the logical soundness of inferences, to construct counter arguments and alternative hypotheses—in short, to think critically" (pp. 4-5). They argue that critical thinking is "goal-oriented" and "purposeful" and that education today must attend to the way that people cope with change: "To shape the future rather than accommodate to it—the need for a better understanding of how to teach thinking skills becomes apparent" (p. 5).

A definition of critical thinking, then, depends both on one's notion of what it means to think critically and on one's view of the reasons for critical thought. Glaser (1985, p. 24) combines these two approaches in his argument that critical thinking involves three principal elements: "*attitude* of being disposed to consider in a thoughtful, perceptive manner the problems and subjects that come within the range of one's experience," "*knowledge* of the methods of logical inquiry and reasoning," and "*skill* in applying these methods" (italics added). He concludes his discussion by arguing that critical thinking is more than a desirable educational objective; it also "helps the individual cooperate with others" (p. 26). Critical thinking, then, can be viewed as an intellectual ability, a strategy for dealing with the world, and, in Glaser's view, a factor contributing to good citizenship.

In one of his many articles on critical thinking, Sternberg (1985, p. 198) addresses the need for critical thinking outside of the school setting, questioning what he calls the "lack of correspondence between what is required for critical thinking in adulthood and what is taught in school programs intended to develop critical thinking." Sternberg contends that school-taught problems are not like real-world problems. He stresses the need to make the classroom experience of teaching critical thinking relevant to students' lives. Sternberg's challenge to educators is to make connections between what is taught in school and what is expected of students beyond the classroom.

Current definitions of critical thinking are strongly grounded in the effort to make critical thinking relevant to students' lives. Chaffee (1987, p. 40), for example, describes critical thinking as "making sense of our world." Meyers (1986, p. 117), too, argues for a broad context of definition, including "a variety of more openly subjective and personal perspectives." For the classroom teacher, perhaps the most meaningful definition will have practical application both in the immediate classroom and in the curriculum of the institution as a whole.

Critical Thinking at Alverno College

Active, relevant, and transferable—these adjectives define the kind of critical thinking that we stress at Alverno College. Our work in teaching and assessing critical thinking is closely tied to our schoolwide ability-based curriculum. For the past twenty years, we have implemented a curriculum in which students work to develop eight abilities throughout their coursework, both in general education and in their academic major and support areas. The eight abilities—communication, analysis, problem solving, valuing, social interaction, responsibility toward the global environment, effective citizenship, and aesthetic responsiveness—are seen as complex systems of intellectual development rather than as quantifiable sets of skills. Instructors determine which abilities are best developed in each course, as an integral part of studying the content of a discipline. As students develop these abilities, they become, among other things, critical thinkers.

In our definition, then, critical thinking is both a systematic inquiry and a mental attitude, a complex set of abilities and a process of dealing with ideas. We define critical thinking as comprising several of the Alverno abilities, especially communication and analysis. As these abilities are applied by students throughout all our disciplines, they take many forms. Critical thinking can include logical approaches to problems as well as creative applications that may at first seem out of the realm of logic. Within this comprehensive definition of critical thinking, analytical and communication abilities play important roles. Students work through a straightforward and systematic approach to investigating, understanding,

and communicating about concepts, ideas, questions, problems, trends, artistic works—everything that presents itself to human understanding.

In the ongoing process of refining our understanding of how to teach and assess critical thinking ability, we have learned through our educational research that an understanding of a complex activity such as critical thinking emerges through attempts to measure it (Mentkowski and Rogers, 1986). The more we actually see student performance on critical thinking assignments and assessments, the more we understand the ability as it is exhibited by "thinkers." In other words, our theoretical construct—what we expect will happen when students attempt to think critically—is expanded and even revised as we incorporate many specific examples of performance into that construct. Concrete examples of our theoretical definition help us come to more complete and insightful definitions.

As a way of synthesizing all of the complex processes that constitute critical thinking, we are currently working with a definition of critical thinking as the ability to apply disciplinary frameworks in personal, academic, and professional settings and to monitor and evaluate that activity. An important first step in this work is the determination of how each discipline deals with its world, how its thinkers do their work.

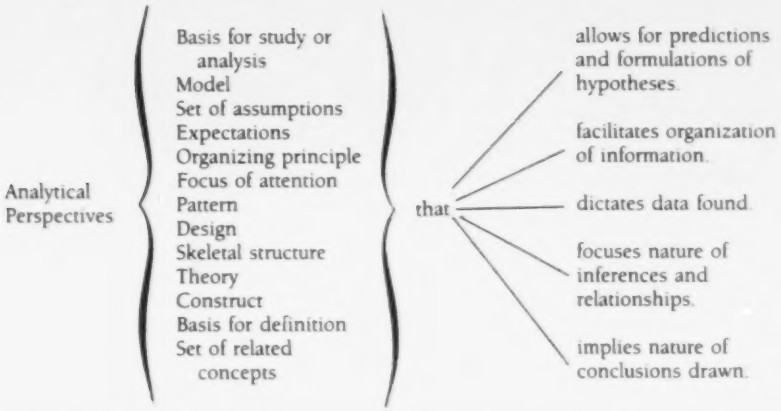
We have identified some of the analytical or conceptual models, or frameworks, that each discipline has constructed to deal with its content. Questions that helped us define disciplinary frameworks were as follows: How does the discipline define reality? What is the nature of knowledge in the discipline? With which facets of experience does the discipline deal? How is knowledge defined within the discipline? What are the key theories of the discipline? What constitutes a problem in the discipline? What is the nature of research in the discipline? What constitutes evidence in the discipline? What is the relationship in the discipline between subjectivity and objectivity?

The answers to these questions indicate unique qualities of each discipline as well as the ways that disciplines intersect. Areas in the humanities, for example, share the idea that "problems" tend to have ambiguous and even open-ended "solutions," whereas the sciences tend to have a much more systematic view of problem solving. Students who learn to recognize such differences will be more successful in defining and solving problems, as well as in determining the most effective way to think through situations.

It has been our experience at Alverno that students become better thinkers when they have an understanding of how people in each discipline think. Figure 3.1 shows some of the ways that educators at Alverno define the frameworks of their disciplines. The figure also suggests how faculty might work within their disciplines to help students organize and understand ideas, facts, texts, and so on.

We encouraged each of our faculty to examine his or her own assumptions and attitudes and to determine a pedagogical definition appropriate

Figure 3.1. Educators' Definitions of Disciplinary Frameworks



to, and achievable in, a given course or program. As a result, our students have many opportunities to practice their ability to think critically, that is, to learn and apply the frameworks of a discipline in significant disciplinary contexts. Students in psychology, for example, analyze behavior within developmental frameworks as well as within clinical frameworks. Students in literature contrast their analyses of literary form (formalist framework) with their insights about the relationship of reader and text (communication framework), or with their understanding of an author's life (biographical framework). In each case, a key component of the student's learning is a conscious awareness of the analytical process involved.

In keeping with our overall philosophy of learning at Alverno College, we believe that students must have the opportunity to learn critical thinking across the curriculum. We do not see the teaching of critical thinking as a drain on the time available to teach the content of our disciplines. Critical thinking is not an "add-on"; it must be seen as an integral part of learning in any content area. Students must actively engage in critical thinking as they acquire the knowledge of a discipline—from the basic ability of supporting inferences with careful observation, to the more complex ability of providing adequate evidence for conclusions drawn, to the sophisticated ability of choosing appropriate frameworks in which to analyze complex data. Also, students must have ample opportunities to practice these abilities. Critical thinking is not a hurdle to cross; it is a lifelong ability to be ever refined and polished.

Assessment

Like the concept of critical thinking, assessment has come to mean many things. In recent years the "assessment movement" has been traveling down

two different, though related, roads. One road is that of program evaluation, the other of student evaluation.

Those who consider assessment as program evaluation are primarily concerned with an institutional picture. Patterns of student performance are examined, usually with standardized tests developed outside of the institution. Consequences of such patterns are generally described in institutional or programmatic terms: Institutions use assessment results to determine how groups of students are doing and to consider needs for overall instructional improvement. Institutions can compare groups of their own students to groups from other institutions that are using the same assessment instruments.

Assessment from the perspective of student evaluation rather than program evaluation yields a different set of considerations. In this case, individual student learning is the focus, rather than group patterns. Generally, the student, rather than the institution, is the recipient of feedback. Consequences of student performance are described in terms of the student's future improvement. While the student is the focus of such assessment, faculty can also determine the sorts of instructional changes that might be needed to improve student performance on future assessments.

The distance between these two roads of assessment will probably lessen over time; there is already much discussion about their intersecting points. For the purpose of this discussion, I concentrate on assessment of student performance, although many of the principles discussed here have implications for program evaluation as well.

At Alverno College, we define assessment as "a multidimensional attempt to observe and, on the basis of criteria, to judge the individual learner in action" (Alverno College Faculty, 1985, p. 1). Our emphasis on the progress of the individual learner is a natural extension of our ability-based curriculum. Over the years of refining our understanding of assessment, a number of significant characteristics have emerged. In any systematic approach to assessment, whether within a comprehensive assessment program such as Alverno's or with respect to an individual teacher's attempt to assess an ability such as critical thinking in a specific course, attention to the following ten features enhances the assessment process (Loacker, Cromwell, and O'Brien, 1986).

Assessment Is an Integral Part of Learning. By focusing on the active learner, we found that assessment is at the center of the learning process, not just at the end of it. In other words, assessment is an ongoing process, not a test that comes at the end of learning. By making students aware of the need to show what they can do with what they have learned, we put assessment before them as an opportunity to try out their learning, demonstrate their progress, show their understanding. If students are learning to read their texts analytically, for example, it makes sense to assess that ability not only at the end of the semester but also throughout their coursework. Many

college educators admit that an analytical reading ability cannot be assumed for college students in their first two years; it must be taught and reinforced. Part of that teaching and reinforcement involves assessment.

Assessment Must Involve a Range of Behavior. It is an unfortunate truth that much of our testing of students is for recall of information. Some of this information can be quite complex and important, but to truly assess student abilities, we must examine more than recall behavior. In assessing critical thinking, for example, what is the behavior that we might hope to see in our students? Perhaps we want to see the student provide adequate rationale for a position taken, or we might want to see how well a student can compare the merits of several solutions to a problem, or we might want to see a student analyze a complex problem, event, or text. I use the word *see* here because we need to see the rationale-providing behavior, the comparing behavior, or the analyzing behavior in order to be able to assess it. We cannot rely only on "choosing" behavior, which is ultimately all we can assess in multiple-choice-type tests. Current interest in role playing, simulations, journal keeping, experiential learning, and writing-across-the-curriculum programs points to attempts at having students actively demonstrate what they are learning in ways that are related to the ability.

Assessment Must Involve Application of an Ability That Represents the Expected Learning Outcomes of a Course, Program, Department, or Institution. Unlike testing, which usually only involves consideration of what a student knows, assessment involves evaluation of what a student can do with what he or she knows. As Wiggins (1989, p. 703), has suggested, a true test "requires the performance of exemplary tasks." To make assessment a meaningful activity, it is important to relate it to learning outcomes toward which a student is striving. At Alverno, we relate each assessment in some way to the curriculum of the entire college, but assessment need not have such a broad scope. For the educator concerned with developing critical thinking, the task is to establish clear student goals for achieving critical thinking in the context of each particular course and then to develop assessments that address not only the mastery of the content of that course but the critical thinking goals as well.

Assessment Involves Expert Judgment Based on Explicit Criteria. Most experienced teachers know good student performance when they see it. They have a background of student work on which to reflect, they know the performance standards of professionals in the field, and they know the level of performance that they hope students will achieve. Teachers evaluate students' work carefully on the basis of these "expert judgments." In a well-developed assessment, the bases for these judgments form the criteria by which student performance is measured, thus they need to be spelled out so that both the teacher and the student have access to them.

If assessment were only an end product and if the teacher alone were to deal with the results, then expert judgment might be enough. But because

assessment is integral to learning, and because the student's progress is at stake, criteria become essential. In our longitudinal studies of students and alumnae, the provision of criteria for performance has been cited as one of the key elements in students' perceptions of their success (Mentkowski and Doherty, 1984).

Assessment Incorporates Structured Feedback. If assessment is to be meaningful to the student, we must respond to it in a meaningful way. As much as students might like an A or a comment of "good work," they can only continue to do well or improve if they know specifically how they did well, or how they fell short of the goal. Specific criteria offer the best means for providing careful feedback to a student. In an assessment of critical thinking in science, for example, an instructor might expect accurate use of scientific terms, but he or she might also want evaluation of several key theories, specific attention to a given variable, adequate grounding in particular texts and sources, and so on. The more we tell our students about our criteria for judging them, the more likely they are to attend to these matters.

The argument has been raised that by giving criteria we just provide students with a set of directions and do not allow for creativity or for independent thought. While this might look like a reasonable argument, we have to consider how much more frustrating it is to try to give feedback to students who say, "I didn't know that's what you wanted" or "Why didn't you tell me that should have been included?"

Again, our Alverno College research has shown that while beginning students might indeed look upon criteria as a set of directions, students do learn to use criteria in increasingly sophisticated ways. They also learn to deal with more inclusive criteria. A student who has learned, for example, that analytical writing involves such criteria as "develops a clear thesis that includes author's stance and a statement of purpose," can proceed in later assignments to a more inclusive criterion such as "writes analytically" (Alverno College Faculty, 1985, p. 74). The student will know how to infer the more basic criteria.

Assessment Occurs in Multiple Modes and Contexts. If we see critical thinking as a complex ability rather than a discrete step in learning, it stands to reason that we cannot assess students' achievement of it in a single situation. We must develop ways to give students multiple opportunities to show their capabilities. By creating assessments that depend on diverse modes (writing, speaking, in-class presentations, laboratory reports, panels, simulations, on-the-spot situations, long-term projects, individual projects, group projects, and so on), we allow students to show critical thinking in a much richer way than if we only assess the ability once and only in one mode (Loacker, Cromwell, and O'Brien, 1986).

Multiple contexts for assessment also provide a richer experience for the student. Certainly, students are expected to think critically in science

courses, but they are also expected to do so in humanities, social science, and professional courses. We need to assess critical thinking in many contexts rather than limit assessment to one area or one course.

Assessment Incorporates an External Dimension. Although I have been stressing the close tie between learning and assessment and the link between classroom experiences and student outcomes, there comes a point at which assessment should stand apart from learning. *Externality* refers to a distancing to establish objectivity for judging student performance. Externality can refer to a new set of materials with which to work. If we want to assess students' ability to analyze an essay, for example, we might give them an essay that has not been discussed in class. Students will have to use the analytical skills that they have been developing in class, but there is an element of externality in the new stimulus.

Externality also can refer to a set of explicit criteria by which performance is judged. When students can see the basis for an instructor's judgment, they are less likely to blame the instructor for bias and are more likely to develop an understanding of the ability toward which they are striving.

Externality also can refer to work with other faculty in a departmental setting to determine assessment strategies and stimuli. At Alverno, we have found it useful to develop common assessments across several sections of some courses. We can compare student achievement, evaluate our own teaching and assessing effectiveness, and help students see that their learning is part of an overall departmental effort.

Assessment Is Cumulative. When students learn to write, we expect that their writing skills will become increasingly sophisticated and that we can call upon them to exhibit those skills in every new writing situation. Likewise, if we define critical thinking as a developmental ability, we can expect to see progress and growth. Assessment needs to incorporate this sense of the increasing complexity of ability. Early assessments might, therefore, be shorter and simpler, with increased demands made on the students as they progress in their development of critical thinking.

While this phenomenon of growing complexity might seem obvious, current practice does not always reflect an understanding of the cumulative nature of learning or assessment. How many of us, for example, assign the same kind of papers or reports to beginning students as we do to more advanced students? We need to assess beginning students on beginning stages of their thinking ability. This might mean that we assess students' ability to do analytical maps of their textbook readings, or their ability to provide specific examples of abstract concepts, or their ability to clarify their understanding of a new idea in letters to their advisers. As students progress, we can assess them in longer or more complex ways, thus making assessment cumulative.

Assessment Incorporates Open-Ended Possibilities. Assessment, in

contrast to testing, needs to give students opportunities to develop their own ways of dealing with a question or a problem. If we only allow for limited answers or solutions, we may be testing for knowledge, but we probably are not assessing for an ability (other than the ability to take certain kinds of tests). The more we can make provisions for students to see their assessments as open-ended rather than fixed and predetermined, the better are our chances of eliciting complex performances. Ennis's (1981) revised definition of critical thinking calls for such open-ended assessment.

Self-Assessment Is an Essential Part of Assessment. Students take ownership of an ability when they can say for themselves that they have mastered it. This criterion is as applicable to an intellectual ability such as critical thinking as it is to a physical ability such as swimming or driving. To help students become aware that they are developing into critical thinkers, we need to give them opportunities to assess their own performances. This might take the form of a criteria checklist or of open-ended questions on strengths and weaknesses.

Surprising insights—for student and teacher—can come out of self-assessment. In an assessment at Alverno in which students were asked to articulate a writer's assumptions, for example, one of my students correctly stated several assumptions. In her self-assessment, however, the student stated that she was not sure that she really knew what constitutes an assumption. In judging her answers, I said that she was demonstrating the required ability; but in examining her honest self-assessment, I realized that additional learning and clarification were needed.

These ten features of assessments are not strict criteria to follow; they are characteristics that we have found helpful in understanding how best to judge and evaluate our students as they learn complex abilities such as critical thinking.

It is my contention that the development of critical thinking—in high school students, community college students, and four-year college students—will not happen if we rely on external measures only for assessment. Based on my own experiences for over fifteen years in working with student learning outcomes, I can say that the development of critical thinking ability (or writing ability, and so on) occurs when students are clear about their goals, when their courses incorporate many opportunities to practice the ability as an integral part of course curriculum, and when assessment is continual throughout the courses.

The development of critical thinking, then, depends on the ways that we teach and on the ways that we assess. We must continue to understand the close relationship between the teaching function and the assessing function. And, understanding that relationship, we must keep the connection between them very clear. As Wergin (1988, p. 5) observed: "If we have learned anything from educational research over the last fifty years, it is

that students learn according to how they are tested. If we test students for factual recall, then they will memorize a set of facts. If we test them for their ability to analyze relationships, then they will begin to think critically." Wergin's point was earlier made by Resnick (1987, p. 47): "Testing practices may in fact interfere with cultivation of higher-order skills that are desired." Both of these researchers are stating what all good teachers know: We cannot expect standardized objective tests alone to elicit a complex ability such as critical thinking.

Stiggins (1988, p. 8) sees value in standardized assessments of thinking, especially in program evaluation, but he too stresses the need for assessment in the classroom since classroom assessments of thinking skills "contribute the most to student learning."

Wergin, Resnick, and Stiggins are not alone in their appraisal that assessment is integral to the teaching function. Baird (1988, p. 41), in a study of assessment in higher education, wrote that "the most reasonable approach to assessment of generic outcomes . . . is to think of the task as analogous to the professor's classroom assessments of student learning." He observed that assessment of cognitive abilities requires the "costlier and more difficult procedure of essay examinations" (p. 42) and concluded that measurement of critical thinking is "best done through the context of a discipline or program" rather than by external standardized tests (p. 53).

Kurfiss (1988, p. 91), in her review of the teaching of critical thinking, stated that "fostering all students' critical thinking abilities and intellectual development requires the participation and support of faculty in every discipline." McKeachie (1989, p. 12) refines Kurfiss's point by stating that the teaching of thinking skills is "likely to be most effective in the context of subject-matter courses."

Conclusion

Some studies stress the teaching side of the coin, others the assessment side, but all of them point to the close—perhaps inseparable—connection between the two activities. What does this connection mean to the community college teacher and administrator confronted with the task of assessing the critical thinking ability of their students? It means that the teacher must develop both teaching and assessing strategies that foster and enhance critical thinking ability, and the administrator must find ways to support that development, whether at the level of the individual teacher or at the level of the department, program, or even institution as a whole.

Ideally, everyone in the institution will be committed to the teaching and assessing of critical thinking ability, but the lack of an institutional program should not daunt the individual faculty member who wants to help his or her students learn to think critically. A basic plan includes the following steps: (1) *Determine course goals* that stress critical thinking. Iden-

tify the key concepts of the course, help students learn and use the analytical frameworks of the discipline or program, teach and encourage practice of specific thinking strategies. (2) *Create learning strategies* that provide students with opportunities to practice and perfect thinking skills. (3) *Develop assessments* that ask for thinking ability in the context of the course content and make the assessments continual. (4) *Give students feedback* that is explicitly based on criteria for critical thinking so that they know how they are developing their ability. And (5), however possible, *work with other faculty*, in the department and beyond, to ensure that the development and assessment of critical thinking continues to be a significant college goal, whether in an individual course or over the curriculum of the typical two-year community college.

Additional Sources: Standardized Critical Thinking Measures

Arter, J. A., and Salmon, J. R. *Assessing Higher-Order Thinking Skills: A Consumer's Guide*. Portland, Oreg.: Northwest Regional Educational Laboratory, 1987. 78 pp. (ED 293 877)

This is a comprehensive guide to assessment measures for critical thinking, including problem solving and creative thinking. The volume describes dozens of instruments in terms of reliability, validity, usability, and so on. The authors include sources and availability and also provide a state-by-state description of educational programs focused on critical thinking.

Baird, L. J. "Diverse and Subtle Arts: Assessing the Generic Academic Outcomes of Higher Education." In C. Adelman (ed.), *Performance and Judgment: Essays on Principles and Practice in the Assessment of College Student Learning*. Washington, D.C.: U.S. Department of Education, Office of Educational Research and Improvement, 1988.

Baird's chapter includes a discussion of commonly used instruments (such as the Watson-Glaser Critical Thinking Appraisal and the Graduate Record Examination). He examines several trends that may affect the future development of instruments, especially the increased interest in cognitive processes that enhance the development of critical thinking measures.

Carpenter, C. B., and Doig, J. C. "Assessing Critical Thinking Across the Curriculum." In J. H. McMillan (ed.), *Assessing Students' Learning*. New Directions for Teaching and Learning, no. 34. San Francisco: Jossey-Bass, 1988.

In their discussion of critical thinking, Carpenter and Doig review five standardized measures. They suggest that faculty assess their own needs before choosing an approach to assessing critical thinking. Questions about students, college environment, and institutional definitions of critical think-

ing should all be addressed before choosing either standardized tests or institutionally developed assessments.

Heywood, J. *Assessment in Higher Education.* (2nd ed.) Chichester, England: Wiley, 1989.

In this comprehensive study of assessment in Britain and the United States, Heywood discusses several taxonomies of educational objectives, especially in the area of critical thinking. He also contrasts objective tests with other kinds of examinations and assignments.

McMillan, J. H. "Enhancing College Students' Critical Thinking: A Review of Studies." *Research in Higher Education,* 1987, *26* (1), 3-29.

McMillan reviews twenty-seven studies of critical thinking research. He includes the specific instruments used in each study, as well as a brief summary of results. This review is of more interest to those who work in program evaluation than to those in classroom assessment of critical thinking ability.

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LUCY S. CROMWELL is professor of English and chair of the Analysis and Communication Division, Alverno College, Milwaukee, Wisconsin.

Writing is an excellent heuristic for making students aware of and teaching them how to use critical thinking strategies.

Skipping on the Brink of the Abyss: Teaching Thinking Through Writing

James J. Sheridan

In seeking to clarify the complexity of the issues that require innovative critical thinking, Botkin, Elmandjra, and Malitza (1979, p. 43) cite the problem of limited energy resources: "It is not scarcity alone which propels the search for new sources of energy, but a vast array of factors that includes economic and political considerations, industrialization, urbanization, life styles, environmental pollution, food production and distribution, depletion of natural resources, militarization, exploitation of the oceans, and the role of science and technology." It is evident that issues such as energy resources present a cluster of problems that cannot be solved solely by technical experts within separate fields. In fact, in some of the technologically mobile areas, the information half-life (the time it takes for half the knowledge base to become obsolete) is six years (Long-Range Planning Subcommittee . . . , 1982). What does this statistic mean for higher education? It means that the knowledge that students acquire as freshmen will be outdated and replaced by their second year on the job. It means that we must focus not so much on content as an end product but on process as a continuing skill. It means that we must teach students the process of critical and creative thinking. Indeed, this teaching responsibility is so crucial that Botkin, Elmandjra, and Malitza (1979, p. 100) believe that "it is difficult to imagine a greater breakthrough for the humanities and social sciences than to make progress in acquiring an understanding of how learning processes work. There is no more significant task with vast consequences for social life that could be put on their agenda."

One way to teach critical thinking is through writing. "When you compose, you give form to thought" (Berthoff, 1982, p. 207). Composition

is an excellent method for making students aware of and teaching them how to use critical thinking strategies. Writing is a thinking heuristic. The act of generating written discourse is not merely a result of critical thinking but also a stimulus to new thinking and new discoveries. With this intertwining of writing and thinking in mind, I agree with Richards's (1968, p. 111) statement that what is needed in this area is "not so much improved philosophic doctrine . . . as sets of sequenced exercises through which . . . people could explore, *for themselves*, their own abilities and grow in capacity, practical and intelligential, as a result."

My attempt to elicit these sequenced exercises in my freshman composition course results in what my students call "the menu." However, this menu is the product of a number of causal steps. It is not something that is passed out by the instructor on the first day of class, rather it is generated by the students, with instructor assistance, through a discovery-invention process.

At the beginning of my composition course, I tell the students the motto that I coined for the course: "You don't know what you know until you read what you have written." They are puzzled by the statement because it sounds like a contradiction: people *do not know* what they *do know*. I help them to discover that the motto is a paradox and not a contradiction by having them do a Freewrite (FW). The FW is the first item on the menu.

Freewrite and Liberation

There are only two rules for the FW: (1) "You cannot stop writing during the ten-minute exercise." (2) "You are forbidden to think. No topic is provided. Write whatever comes into your right (or left) hand. You must keep on writing. Even if you say 'I don't know what to write,' write that. You cannot scratch your head. You cannot gaze pensively at the ceiling. Just write. You are not responsible for what you say; your hand is doing it all. Say anything. Say 'This is the worst exercise I ever heard of and I can't believe they're paying this guy good bucks to have us do it.' Yell, scream, shout, kick (in written words). Say anything, but keep writing. Forget about grammar. Spelling is of no concern. Punctuation doesn't exist. Who cares what a paragraph is. Just write. Don't worry about sentence structure. If you get a new image or idea in the middle of a sentence, go for it. Let it all hang out. Swear if you want to; obscenities are acceptable. Someone in the back row is furling his brow in studied concentration. Stop that! It's against the rules. No thinking allowed. Write!"

At the end of ten minutes, the apparent chaos is stopped and students count the number of words that they have written. They are surprised to discover that they have each written two hundred to four hundred words in ten minutes, without any preparation, without a topic, and without thinking. Besides being surprised, they are also a tiny bit proud of what they have accomplished. After all, they are only twenty minutes into the

first class of the quarter. They had enrolled in various stages of terror because of lack of confidence in their writing abilities, and here they have written hundreds of words in a few minutes with a minimum of pain.

This first FW is the beginning of the students' liberation. It helps them break the writing-is-grammar chain that has shackled them, through no fault of their own. This conception of grammar stultifies the freedom and the risk taking necessary for innovative critical thinking. A truer definition of grammar refers to all that is inside the head of a native speaker. If we taped all the utterances of a typical six-year-old the day before he or she enters kindergarten, we would discover that 95 percent of what the child said is grammatically correct. So students do have a grammar locked into their brains. Moreover, research strongly suggests that there is no correlation between the study of grammar and improvement of student writing (Braddock, Lloyd-Jones, and Schoer, 1963; Hillocks, 1986).

I ask the students if their FWs would be intelligible to someone else. After some hesitation, they agree they would be. I ask how this can be so since they had no topic and were forbidden to think. Depending on how they respond to that question, I go one of two ways. If they are unable to answer, I do my "skipping on the brink of the abyss" routine, or, if they do answer, we get into a discussion of right- versus left-brain thinking.

Fear of Skipping

"Skipping on the brink of the abyss" is my central metaphor for the teaching of thinking through writing in my composition classes, and it also serves as the focus of the teaching of thinking through analysis of significant passages in my literature classes. If the students hesitate too long in answering the question on the intelligibility of their FWs, I immediately inform them that we have to establish some ground rules when I ask a question. They are to assume that I assume that they do not know the answer to any question that I ask. They should further assume that I probably do not know the answer myself. They should not think of answering questions as an exercise in recalling something that they should have learned in a previous educational experience. Nor should they consider answering questions as an oral quiz whereby the instructor ensnares the unprepared. Rather, the question and the formulation of the answer constitute a process of critical thinking that leads us to knowledge and truth, or, perhaps, to more questions.

The point here is connected to the "you don't know what you know until you read what you have written" motto. Students assume that good writers, that professional writers, know what they are going to write before they write it. Students think of the writing process as a recording: The writer knows something *and then* he or she records it. They assume that the same characterization applies to thinking. Their experience is that

instructors know the answers before they ask the questions. It then becomes the duty of students to recall the answers or to guess what the instructors want to hear. I insist that good writers do not know what they are going to write before they write. Writing is a discovery-invention process that occurs during the stages of pre-writing and writing. The text that results from this process does not exist full-blown in the writer's head.

Student assumptions about thinking extend beyond the instructor. They assume that all good thinkers, the "really intelligent people," already know the answers and that they simply push the proper button when a question is asked and their brains then spew forth prerecorded messages. Since the students know that they themselves do not know the answers (just as they do not know what to write), they convince themselves that they are not among the elite blessed with the power to think and to write well.

Actually, what is holding them back is fear. They step up to the edge of the abyss of the unknown, and they are afraid they will fall into the chasm of failure. So they draw back to the secure ground of not writing and not thinking. What they must learn to do, what good writers and thinkers can do, is skip easily along the brink of the abyss. When they learn to skip in this manner, fear of the abyss disappears. When they learn to skip well consistently, the whole damned abyss disappears. The FWs that they have just produced in my course are initial evidence that the abyss is not as deep as they originally believed. And, I assure them, once they learn to skip on the brink, they will enjoy the experience.

However, they must not concentrate on the end product (the finished paper, the right answer) but rather on the task of learning the process, the skill. The task is like playing tennis. If one concentrates too much on the score, on winning the game, then one is liable to tense up and destroy one's form. But if the concentration is on the process of hitting the perfect tennis shot for the sheer joy of hitting the perfect shot, then the form will be smooth and fluid, and, incidentally, one will win the point and the game.

Left Versus Right Brain

Either before or after the introduction to skipping on the brink of the abyss, I initiate a discussion on left- versus right-brain qualities: The left brain tends to be concerned with sequential, logical order, with parts, and with facts and figures; whereas the right brain is more intuitive, concerned with whole patterns and with emotion and motor skills (Williams, 1983). In this brief characterization of brain functioning, I am not concerned about clinical accuracy vis-à-vis the right and left hemispheres of the brain, and I use the terms right and left brain almost metaphorically in order to stress the different phases in the composition process. As far as writing is concerned, I want the students to think of the right side as the creative, intuitive side and the left side as the editorial, organizational

side. The key point is that one should not try to use both sides at the same time while writing, otherwise the editorial left brain slows down and overly restricts the creative right side. Since students have been programmed to think of writing in terms of correct grammar, they tend to overuse their left sides. Therefore, at the beginning of the course, the emphasis is on the right side.

After some discussion, the students come to the conclusion that during their FWs they had turned off their censoring left brains once they had been assured that they were not responsible for the content and that they did not have to worry about grammar or organization. Of course, they did not obey my commandment "thou shall not think." They cannot not think. What happened was that their intuitive, spontaneous, emotional right sides kicked in and they dashed off the written pieces without interference. Of course, the pieces are disorganized and lack unity. Of course, the left-side editing-organizing function is important, but not now! Not at the genesis. One cannot edit nothing! Allow the right side free play to generate the words and the ideas, however inchoate; afterward the left side can bring order to them. It is trust in the right side that gets one to start skipping on the brink of the abyss.

I constantly emphasize to the students that they each have a miracle in their heads—the brain. I want them to appreciate and be aware of the power of thinking, the power of language. To demonstrate that they have this power, I ask a question that requires a two- or three-sentence answer. I write a student's answer verbatim on the board and then do a linguistic analysis, pointing out the complexity of the syntax and word choices that the student has used, apparently with little conscious thought or effort—an oral FW. It is probably true that the student has never before uttered or heard those words put together in that exact combination. Equally miraculous, the other students understand the thoughts of the answering student because their brains instantly translate a number of arbitrary sounds into abstract ideas.

I want to establish both an awe and an awareness of the incredible power that they possess. These attitudes increase their confidence that they can think, and confidence is an essential ingredient in learning to skip on the brink of the abyss. Moreover, an early start on thinking about how the brain works helps them during the metacognitive phase of the course, which follows later.

Focused Freewrite (FFW) and Metaphor. The next step is the FFW. The rules are the same as those of the FW ("don't stop writing and don't think"), except the students are now given a topic on which to focus their FWs. After the FFW is introduced, we start every class with a five-minute FFW. By the fourth class period in the quarter, the students are so used to the procedure that I walk in and say, "Topic is Ronald Reagan, go!" and their pens race over the papers and they each knock out two hundred

words on their uncensored reactions to the past president. The next day, the topic might be drugs or AIDS or rock concerts. What is established is that they do have brains that work, that they do know and can write something about the world in which they live, and their confidence levels go up. Sometimes the students share their FWs, but the discussion centers on analyzing how the students' minds were working, as examined in terms of the action of writing rather than in terms of the content.

Metaphor is introduced early in the course. This choice surprises my students (and some colleagues) because they construe metaphor as a sophisticated literary tool apropos only in poetry and advanced writing classes. Not so. The ability to construct metaphors is a crucial writing skill that needs to be introduced early; moreover, most students take to it readily after generating examples of metaphor and simile in everyday speech. Metaphor not only makes their writing sparkle, it is an entrée to metaphorical thinking: to seeing commonality in difference, to discerning patterns beneath an apparently patternless surface, to finding order in chaos.

We begin with very simple examples of fill-in-the-blank similes. For example, students are asked to complete the following sentence: "When Bernie Kosar threw the game-winning touchdown with only one second remaining on the clock, the roar from the eighty thousand Browns fans sounded like. . . ." After some practice, students are required to write three metaphors per week in their journals, and they must have at least two metaphors in any finished paper that they submit.

Real-Life Assignments. In constructing the writing assignments, I endeavor to make them "real life" and valid as opposed to purely academic. The students always have a context for writing and never write for or to the instructor, as evident in the following example: "Assume that you are a member of President Bush's administrative team. Write a position paper for the president in which you identify and offer three solutions for a national issue that the administration should tackle in the next six months. The president wants your best solution, an alternate but viable solution, and a third solution that appears viable but is, you believe, incorrect." The point of this assignment is not the content but the process of establishing thinking strategies whereby students can learn to handle this and similar problems with a facility born of confidence. It would therefore be ridiculous for me to tell the students that I wanted outlines of their papers on Monday and finished drafts in ten days. In other words, the assignment is not homework to be done outside of class.

The heart of my thesis is that writing is an excellent method for teaching critical thinking; therefore, the important matter to be accomplished during the class periods is the construction of the sequenced steps necessary to produce the paper. In other words, we, the students and the instructor, work on the development of a double-helix model of thinking-writing in which thinking and writing are intertwined in mutu-

ally beneficial or symbiotic coils. How is this model developed? By generating a menu of thinking-writing strategies. Notice again that this menu is generated mainly by the students, with instructor guidance. It is not a preprinted handout. Why not, since I inevitably know almost all of the items that will eventually appear on the menu? Because the essence of the exercise is that the students *internalize* these thinking-writing strategies. They will more quickly and more deeply internalize if they are an important part of the process of generation. A similar method is used when we come to evaluation of the papers.

Menu of Thinking-Writing Strategies

How is the menu generated? The method is as old as Socrates: questions (and patience). Take the Bush Memorandum (as the writing assignment came to be called). The first questions are (1) What are the national issues? (2) Which issue should be the subject of the paper? These questions start a babble of suggestions out of which we evolve the Brainstorm (BS) item on the menu. (I am indebted to Edward de Bono [1970] for some of the thinking strategies employed and for the concept of identifying them with abbreviations. This naming system makes it easier for students to recall the items and, because of the inherently secretive nature of codes, gives them a feeling of belonging to a special club.)

So, each student brainstorms a list of national issues, and then we share the results and do a classwide brainstorm (other times, the students brainstorm in small groups). As a result, forty to fifty national issues are written on the chalkboard. Now what are we going to do with these issues? They lead us, perhaps, to do a Categorize Completely (CC) in order to group and reduce the number of issues. Subsequent questions may lead to a Prioritize Please (PP).

Two points warrant mention here: First, I try to be patient and allow the students to follow a sequence that I know might not be the most fruitful in order for them to *discover* that fact for themselves. I cannot recall who said it, but I agree with the statement that "errors are an exercise in competence." Second, although the menu is generated in linear fashion, it should be remembered that the thinking-writing process is reflexive—it doubles back on itself in a recursive spiral—so that items used early in the process may be reused in later stages. With those caveats, a typical menu for an eleven-week quarter in English 101 might look like Table 4.1.

It is not my purpose here to explain how every item on this menu is used (most of them are self-explanatory); however, one more example of an assignment may help to clarify: "You are a member of your local school board. A third-grade child, Jennifer Stanton, has contracted AIDS through a blood transfusion. A special public meeting of the school board has been called to decide how Jennifer's case should be handled since this is the

Table 4.1. Menu of Thinking-Writing Strategies

FW	Freewrite
FFW	Focused Freewrite
BS	Brainstorm
CC	Categorize Completely
PP	Prioritize Please
AWOL	Alternate Ways of Looking
A&D	Advantages-Disadvantages
CA	Creative Alternative
COCO	Compare-Contrast
SPS	State Problem Specifically
MM	Mine for Metaphors
ECO	Essential to Consider Opposition
AS	Alternate Solution
CP	Consider Position
SYP	Sequence Your Points
SIH	Stand It on Its Head
WIP	Write It in Pieces
CS	Close Strongly
DDC	Disobey Directions Creatively
TNS	Take the Next Step
E = D + A	Explanation = Definition + Application

first occurrence of this problem in your school district. You must present a paper recommending a course of action to the school board. Present at the meeting, beside the school board and superintendent, will be Jennifer's parents, parents of Jennifer's classmates, Jennifer's teacher, other teachers and parents, a lawyer from the American Civil Liberties Union, and members of a fundamentalist religious group. Remember that whatever you decide in Jennifer's case will become board policy for future AIDS cases."

With this kind of assignment, the students quickly see that whatever else they choose from the menu, an Alternate Ways of Looking (AWOL) is essential to consider the problem from the viewpoints of the various constituencies. They also do an Advantages-Disadvantages (A&D) to make a side-by-side listing of the pros and cons of keeping Jennifer in school. And they may realize that the key to their paper (and argument) is a Creative Alternative (CA).

The Evaluation Process

During the evaluation process, I follow the principle espoused earlier on internalizing the process: "If you want them to internalize the process, they must help generate the process." So, when the students turn in their finished drafts, I read them and make notes on a separate sheet of paper, but I place no marks on the students' papers except for a number from 6 to 10 (roughly equivalent to D to A+). I then choose five or six papers that

exhibit certain strengths and/or weaknesses, remove the names and grades, and xerox copies for the whole class. I normally start with two papers that I have determined to be a 7 and a 8.5 (C and B+), respectively. I then ask the students, *without* giving them any guidelines or criteria, to read each paper twice and determine holistically which one they think is the more effective. As a class, the majority always agrees with my evaluation. Often, every single person agrees with my evaluation. I then inform them that their evaluations agree with mine and point out that they definitely know good writing when they see it. Now I ask them to give me two specific reasons for their choices.

This process generates a list of writing guidelines from clearly stated thesis to development, from word choices to sentence variety, from organization to conclusion. The point again is not the list or the order of the listings but that the list is generated through a process in which the students play an integral part. They more effectively internalize the principles of good thinking-writing through this kind of process of involvement than when they read comments scrawled around the margins and at the end of a red-ink-infested paper, which looks to them like a wounded victim dying from an unfair attack and to which their reactions are to look at the grade, curse the instructor, crumple the paper into a ball, and throw it into the nearest wastebasket.

Metacognition. Beyer (1987, pp. 214–215) has stated that "unless students are helped to become conscious of their own thinking, keep track of what they are doing when they engage in thinking, and assess the effectiveness of what they do, they cannot take control of their own thinking and become self-directed thinkers." To that end, each of my students turns in a process page with the finished draft of his or her paper. The process page is a FFW on the various thinking and writing strategies in which the student engaged during the creation of the paper. The process page is not graded but is required. It becomes an act of metacognition, forcing the student into self-reflection by concentrating on the thinking processes that he or she has used. It also reenforces the thinking strategies menu and provides a history and a map for sequencing strategies.

As an adjunct to the process page and to assist metacognitive activity, each student also keeps a writing journal, which also is done in the FFW mode and is graded satisfactory or unsatisfactory. The only requirement is five hundred words per week on the topic of writing. Students can ruminate about problems that they are having with their own papers; they can relate their reactions to small group sessions, to the instructor's remarks, to the students' papers discussed in class—to anything that relates to thinking-writing. The task of writing the journal thus gives students additional writing practice, bolsters their self-confidence that they can produce words on paper (five thousand words per journal over the quarter), and makes them more conscious of the thinking-writing process.

Result. Do all or any of these strategies work? Do the students write and think better? Based on my observations and experiences, the answer to both questions is yes. Research on thinking-writing strategies needs to be done. But since it is hard to come by now, I offer the following only as a small inchoate effort.

At the community college in which I teach, two sections of Honors English 101 competed in a writing contest. I taught one section using the methods outlined above, and the other was taught by a colleague using the more traditional rhetorical approach to teaching composition, including a grammar review. Having been prescreened for entrance into honors sections, both groups were homogeneous. Near the end of the quarter, the division head for English presented to the classes the topic that she had selected for the contest. The topic was presented to the classes at 9:00 A.M. on a Friday, and the paper was due at 9:00 A.M. the following Monday.

No student or instructor names appeared on the papers, although the papers were coded for group identification. The two sets of papers were mixed together and given to two outside English instructors for holistic evaluation. They evaluated the papers separately and graded them A through D. The letter grade was then given a number equivalent and the total points awarded to each section were computed. The section that I taught totaled 705 points, the other section received 450 points. Recognizing the design problems, I am not presenting this anecdote as solid research. The original conception of the competition was not scholarly research but rather a friendly competition. Because I am convinced that the writing and thinking processes are intricately intertwined, I view the result of the writing contest as a manifestation of thinking as well as writing abilities.

Both my personal experiences and the contest have convinced me that the process of critical thinking can be broken down into specific skills, that these skills can be taught, and that writing is an excellent method for doing so. I am convinced that this method better enables students to skip on the brink of the abyss. It certainly delights me that they leave the class with a little less fear of falling into the chasm.

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JAMES J. SHERIDAN is professor of English at Cuyahoga Community College, Parma, Ohio.

The time has come to consider practical strategies for incorporating the teaching of thinking skills into social science courses in community colleges.

Teaching Critical Thinking in the Social Sciences

Carol Lynn H. Knight

Last spring we heard that the Medical College Admissions Test is being revised to reflect the increased emphasis by the Association of American Medical Colleges (AAMC) on students' writing and thinking skills. The AAMC wants pre-med students to spend more time developing their abilities in problem solving, critical thinking, and communications. Thus, one more voice is added to the growing chorus insisting on the teaching of thinking across the curriculum.

The term *critical thinking* is often used generically. Ennis's (1987, p. 10) widely accepted definition asserts that "critical thinking is reasonable, reflective thinking that is focused on deciding what to believe or do." As such, the reference is to both dispositions and abilities employed across the whole range of thinking operations and strategies and does not exclude creative thinking.

The social sciences study people and how they live or have lived. These disciplines—history, political science, economics, sociology, psychology, and anthropology—require practitioners to develop appropriate criteria for evaluating evidence, generalize from observed facts, conceptualize hypotheses that serve as possible solutions to posed problems, and make judgments about the relative strengths of competing hypotheses. In other words, embedded in the core subject matter of these disciplines are the thinking skills commonly called critical thinking and creativity and the mental strategies used in decision making, problem solving, and conceptualization.

If, as teachers, we believe that it is not sufficient for us to pass on to our students the information and opinions that we have acquired, that we must also enable them to gather and evaluate the data required to make judgments

of their own, then we have no choice but to teach thinking skills as part of the process of teaching our own subjects. Optimally, the teaching of thinking should produce a critical and creative disposition that enables a person to transcend biases, evaluate situations and ideas objectively, and create habits of mind that extend beyond academics to life experience in general.

Preparation for Teaching Thinking: Getting Started

Once we decide to incorporate the teaching of thinking skills into discipline-specific instruction, we shall find that most of the skills to be taught are not new but instead familiar tools used more explicitly, more precisely, and metacognitively. McPeck (1981) argues that, in fact, the only possible way to teach thinking skills is within the context of a discipline. While this familiarity may be a comforting realization, it is also deceptive because the teaching of critical thinking requires radical redesign of our courses.

Mastery of the Discipline. The first step is absolute mastery of one's discipline and its literature. It is sheer folly to believe that only young instructors innovate whereas older professors are propped up by the yellowed, dog-eared pages of antique notes. The fact is that novices in the classroom, uncomfortable with presentation styles and still assembling and organizing the body of knowledge that they will communicate, are the most closely tied to their notes. The freedom to redirect classroom time and allocate learning tasks to students comes from control of the subject matter. And this control is the first step toward the effective teaching of any subject, but particularly the effective teaching of thinking skills in the context of a discipline.

Mastery of Thinking Skills. Even if we have had previous instruction and have developed skills in logic, problem solving, or decision making, the next step is to hone those skills. Enrollment in a course in critical thinking, development of a reading program on the topic both generally and as it applies to our discipline, and attendance at national or regional conferences or workshops where we can make contact with expert practitioners are all good ways to start. Select a good informal logic book, such as Scriven (1976), that covers a wide range of thinking skills and a book on basic problem solving, such as Rubenstein (1975), to use as references.

Learn How to Teach Thinking. Knowing how to do something is not the same as knowing how to teach it. In our own fields, even if we have not had any formal training in teaching, we have had the opportunity to observe many skillful communicators of the ideas that we now teach. Very few of us have had the opportunity to observe equally varied or numerous examples of skillful instruction in thinking skills. It is much easier to take a body of knowledge and blend it with a method of instruction that develops thinking skills if we have had the opportunity to consult with instructors who have achieved this goal. Access to this kind of prior experience of others explains why enrollment in a course on the teaching of thinking

skills or attendance at a conference devoted to the teaching of thinking is imperative.

Preparation for Teaching Thinking: Redesigning Courses

Each of us determines the organization of our own courses: the topics to be covered and the information that we believe students can master on their own. If we choose to focus our attention on concepts and theories and the intellectual processes by which they are established and evaluated, we must begin by identifying the principles that we want our students to remember and the thinking processes associated with those principles so that we can restructure our courses to teach the discipline-specific concepts and the associated thinking skills at the same time.

A distinction must be made between the "facts" of a discipline and the theories or principles used to interpret those facts. Both are essential to mastery of the subject matter, but while students may be able to master the objective data on their own, the interpretative frames and the intellectual skills associated with collecting, evaluating, and even challenging the data should take place within the more structured environment of the classroom. Throughout, then, when I refer to the mastery or testing of facts, I am referring to the specific objective data that are analyzed. While knowledge about them is essential to an understanding of the principles and theories of a discipline, this specific knowledge is never the only goal of a course.

Discipline-Specific Thinking Skills. A newsstand tabloid asserts that astrological signs determine longevity. An insurance company believes that there is a correlation between red cars and the incidence of accidents. A city that has gone without rain for three months hires someone to perform a rain dance and three days later it rains. What would a social scientist make of these incidents? We may laugh at these examples, but in every one of our courses we teach that association is not causation. The ability to determine when a causal relationship does in fact exist is one of many thinking skills that are an inherent part of the social sciences. The point is that in each of our disciplines there are specific course topics that require explicit instruction in thinking skills.

We all teach argumentation in some form. We require students to analyze documentary or monographic literature in order to evaluate the theses of diverse works. We often instruct them in the specific fallacies associated with the principles of our own fields, such as the error of presuming causation, the fallacy of composition in economics, or the common difficulties in statistical induction caused by samples that are too small in size or unrepresentative of the target population. We expect our students to be able to interpret charts, graphs, scatter plots, and the like, and usually our textbooks have appendixes that explain how to interpret the data. We

warn our students that there are a host of impediments to clear reasoning, that we must become aware of our own biases, the extent to which our world views forge assumptions, and how wishful thinking may lead us to reject the conclusions of a perfectly sound study simply because they are contrary to what we want to believe. We insist that the history textbook, like the political science or any other textbook, should reflect the point of view of the author or authors and should present arguments, not just facts. But what we often fail to do is to teach students the fundamentals of argumentation so that they are able to break arguments down into premises and conclusions and spot common fallacies such as the "straw man," the "slippery slope," or the "false dilemma" as well as questionable classifications, unknowable or questionable statistics, and covert biases.

Similarly, we all stipulate definitions of terms unique to our own disciplines. When we speak of "scarcity" or "socialization" or use common words such as "exceptional" or "conservative" in particular ways, we always explain what the terms mean in the specific contexts of our courses. The task of teaching students how to define terms, the types of definitions and how each is best used, and the problems of using terms that are too broad or narrow, circular, overly complicated, vague, or persuasive means teaching the power of precise language use.

We all teach how theories are constructed to explain events, usually through some step-by-step process, and we teach methods for evaluating those theories, such as noting how variables are determined and defined; understanding the assumptions made; seeing how hypotheses are formulated, how predictions or implications are deduced, and how predictions are stated; and determining whether the evidence supports or rejects a theory. These are examples of the teaching of problem solving. This kind of teaching should not be restricted to lessons associated with textbook chapters. Problem solving should be taught as a model that is applicable throughout the course as new theories are introduced so that the problem-solving procedure becomes second nature to students. Similarly, we all study the decisions made by groups or individuals. When the results of an election are evaluated, when the reasons for some action are analyzed, we are essentially looking at the decision-making process from the point of view of the end product, which helps clarify the process. We are, in effect, looking at a given decision as contemporaries would have, and this viewpoint gives students a method for understanding the past. It also helps them understand what questions were, as well as could and should have been, asked about a given event.

Each of our disciplines imposes an elaborate system of classification on the data used. We sort out theories and theorists by type, we deal with people and societies in groups, we constantly arrange data so that they become manageable, so that they tell a story, so that order can be imposed on them. Classification is a thinking skill, and its use and the implications of its misuse,

such as the false conclusions drawn from analogies based on improper classification or the political ramifications of classification schemes based on race, sex, or age under the law, are equally important to understand.

Common Core Thinking Skills. While the subject matter of social science courses varies considerably, there is a core of thinking skills common to all of them that should be explicitly identified and taught in order to make students independent consumers of ideas and to help them better understand the principles of each discipline studied. This core includes the following:

Argumentation. The skills here involve identifying cogent versus fallacious reasoning; distinguishing between deductive and inductive validity (particularly the basic principles of inductive validity as they apply to natural language arguments, such as those based on enumeration or generalization, analogy, or statistical induction and those that demonstrate causation); understanding the general rules of implication and consistency; and recognizing the many impediments to cogent reasoning that arise from ego and ethnocentricism (Paul 1984). The task of teaching argumentation also means teaching a method for argument analysis and argument construction. My method, which is essentially generic but closely resembles the method described by Browne and Keeley (1986), identifies the presence of an argument; delineates conclusions and premises, including missing premises; analyzes each premise independently, including any common fallacies associated with the premise; asks what other information or points of view should be considered; and requires students to determine, finally, if they are persuaded to accept the conclusion and for what reasons.

Definitions. The skills here involve understanding the rules of good definitions, their types and uses, and the problems associated with poor definitions. These skills enable students to make judgments about whether particular disagreements are substantive or merely trivial in consequence.

Problem-Solving and Decision-Making Strategies. The skills here involve the formulation and execution of basic step-by-step approaches such as those outlined by Beyer (1988, pp. 154–155, 164) for problem solving (recognition, representation, formulation of a solution plan, execution, and evaluation) and for decision making (definition of goal, identification of alternatives, and analysis of alternatives, including the ranking of alternatives and selection of the best among them).

Conceptualization or Classification. The skills here involve the process of organizing information. Beyer (1988) treats this process as a thinking strategy similar to problem solving and decision making, whereas I see this as a process that we start by asking why we are trying to organize a particular body of information and then pursue by identifying all the possible ways to organize it, understanding the implications of each classification scheme, and, finally, choosing a particular scheme of organization, for a stated reason, to interpret the data classified.

Creativity. Perkins (1981) and de Bono (1970) tell us that creativity is a habit of mind that can be developed. The habit of using alternative thinking strategies can be encouraged and can be built into our courses, as much as can any of the other skills mentioned. The practice of asking hypothetical questions is not irrelevant, rather it is the key to breaking down walls that separate persons and cultures. It puts us in the other person's situation, helps us see the world as he or she might see it, and helps us frame questions that we might otherwise never ask.

We shall know that we have been at least partially successful in this restructuring of our courses when our students can perform at least as well on exams of a factual nature as they did previously, even without our allotment of as much classroom time to explanation of those facts, and when they perform better on the analytical portions of the exams.

Teaching Techniques

Teaching for thinking is a Socratic and interactive process that puts the burden of participation on the student and not just on the teacher. The process requires the student to assume the major responsibility for learning and makes the teacher the coordinator, the resource, the facilitator. Use of a variety of teaching strategies, so that no two classes are ever taught in exactly the same way, may help keep a course alive, students awake, and learning stimulated. Here, then, are suggestions for reworking lectures and presentations, organizing discussions and classroom experiences, making course assignments, choosing textbooks and collateral materials, and testing.

Lectures and Demonstrations. Good news! The lecture method is not dead. Bad news! It has changed. The lecture, as well as presentations and demonstrations conducted by the instructor, may be the most efficient method for conveying factual information and complex ideas. While this method of teaching has been criticized for its focus on students whose learning styles enable them to absorb information presented in this way, a more serious charge against the lecture is that it does not encourage the development of thinking because information is presented passively and conclusions are drawn for students rather than by them.

This criticism gives us clues to the strength of the lecture. Lectures can entail the presentation of an argument in which a thesis is advanced and defended. Thus, lectures can be used to teach argument analysis. We start by requiring our students to become familiar with the factual information used as evidence, then we present our thesis, explaining why we support it rather than others. Next, we hold our conclusions open to their criticism. They should be able to evaluate our arguments just as they would any others, which brings us to the second strength of this method. While it is true that not everyone learns best by hearing information, it is also true that the vast majority of decisions that we make about everyday events are

made on the basis of hearing oral arguments—from the claims of advertisers or politicians to assessments of world events on the evening news. We have no choice but to train our students to develop the habit of analyzing oral arguments.

Discussions. One of the most difficult classroom strategies to use successfully is the discussion because it so often degenerates into unfocused expressions of vague opinions, or into harangues by teachers when students are not prepared. The key to success here seems to be planning. If possible, schedule a brief amount of class time to allow students to look over the material to be discussed, or if the assignment is such that it must have been read in advance, have them turn in brief written summaries, for which they receive credit, on the day that the discussion is scheduled. This plan should ensure a reasonable degree of student preparation and participation.

Make every discussion an exercise in argumentation. Students must become accustomed to asserting and defending positions and evaluating the strength of all arguments presented in the classroom. Lessen the fear of participation by setting the tone. Beliefs and opinions are respected but bad arguments are challenged. Play devil's advocate. Challenge them, probe, ask the rest of the class to criticize or shore up weak positions. An atmosphere that encourages the free play of ideas is conducive to the construction of sound arguments.

Experiential Learning Exercises. "Hands-on" learning experiences in the classroom give students direct contact with the subject matter. The range of experiences that can be created is almost endless. Oral history projects, polling experiences, applications of investment variables in computer simulations, and the like put students in the position of having to manipulate the raw materials of a field and make abstract theories and generalizations about the subject matter and thinking skills employed in the discipline more concrete.

Assignments. At least three different goals can be accomplished with assignments in order to teach thinking skills. First, since, through course reorganization, less class time can be spent on reiteration of the basic factual information that students are still required to know, assignments can be structured to help them master this information. Textbook publishers' prepared study guides, computer-assisted learning packages, or teacher-developed materials can be used to let students know what they must learn in order to understand the discussions of theory, participate in classroom activities, and succeed on tests. With even minimal credit for completion of worksheets, study guides and the like provide an additional incentive to learn the material. Furthermore, these guides or worksheets alert us to points that need attention in class, to students who are falling behind, to concepts that are too difficult for students to learn independently.

Another kind of assignment, for which only a little credit need be

given, is keyed to daily classwork. Give a lecture or organize a discussion on some topic and then ask the students to take five minutes to write out an argument in support of or against some position relevant to the topic covered. This type of short, frequent assignment, perhaps worth up to a total of ten points in the final grade, gives students the opportunity to practice constructing arguments, encourages attendance and participation, and indicates if the topic in question was understood.

Major assignments, preferably writing assignments, which call for analysis and evaluation of a substantial work or body of data, can reinforce both discipline-specific goals and thinking skills. Case studies that replicate classic problems in the field and exercise decision-making or problem-solving skills, and readings that present strong points of view or conflicting points of view for analysis, are examples of assignments that require students to engage in critical thinking.

Choosing Textbooks. Recently, publishers have begun offering what are purported to be critical thinking textbooks for a number of fields. Whether or not the claim is valid, and whether or not the books are effective in a particular course, can only be determined by the instructor. But it seems to me important not to sacrifice content and organization for pedagogy here. If a book already in use is satisfactory, stick with it. For a course in which less class time is spent on teaching facts than on teaching theory and applications, the textbook must be strong enough to serve as a reference and resource. When choosing new books, consider those with ample collateral materials, as these facilitate the construction of drill and practice exercises, worksheets, and study guides to ensure that the basics are covered. Computer-based instructional packages and test banks, in addition to traditional print materials, can also be very useful. Demonstration disks of the software are usually available on approval, and it is worth taking the time to try them out as these programs are not all equally easy to use. Textbooks with review questions at the end of each chapter are easily adapted to classroom discussions and provide a useful source of essay questions.

Testing. The old adage about "testing what one teaches" now means that tests have to cover the factual material that students must master, the theories and concepts emphasized in class, and the thinking skills taught. Testing, by which I mean assessment of the information and skills learned, takes many forms and is not necessarily restricted to the "set-aside" hourly format. Intriguing tests that require students to think about what they have learned and apply it in new situations may tell us more about what was really learned in a course than is achieved with any other measure. While the test items may be of any type or mixture of types, tests that at least in part give students fresh problems to solve, hypothetical situations in which to describe behavior, documents from which to draw conclusions, arguments to analyze that contain errors of fact and/or reasoning, or raw data

to evaluate simultaneously assess mastery of the principles of the discipline and thinking skills.

Problems Encountered in the Teaching of Thinking and Benefits Derived from This Approach

Higher education has come under fire both for failing to teach the basics of cultural literacy (Hirsch, 1987) and for teaching cultural and even moral relativism (Bloom, 1987). Those involved in the critical thinking movement are sensitive to these charges because the teaching of thinking does take classroom time away from the teaching of facts and because the teaching of argumentation, problem-solving, and decision-making skills and the encouragement of creativity clearly lead students to the conclusion that there is almost always more than one coherent way of looking at issues.

Questions about cultural literacy are most simply answered by testing. If students perform as well or better on questions of fact than they did previously, we are justified in spending class time on principles and applications. There has never been a suggestion from those in the critical thinking movement that students do not need to know basic facts. Rather, their argument is that whereas students can learn facts on their own, they cannot learn higher-order thinking skills and applications of the principles of our disciplines on their own; so that is where we are obliged to devote instructional time. The aim is not to water down courses but rather to enrich them.

Questions about moral relativism are more difficult to answer. Fundamental values and beliefs are not easily changed by rational persuasion. The purpose of higher education is not necessarily to shape those values but to acquaint students with the wider world of values, to legitimize other world views, and perhaps, finally, to help students understand why they hold their particular values.

On a more practical level, other criticism may emerge. Without doubt this approach to teaching increases students' responsibility for their own learning. The teacher becomes the resource and the mentor. The student is not allowed to be a passive learner. From this arrangement may come complaints that the course is too difficult. The task of persuading students of the value of a thinking skills approach may begin with the statement of course objectives provided in the syllabus, but, ultimately, persuasion depends on how lively, interesting, challenging, and useful the instruction proves to be. Also, while "critical thinking" is a popular educational buzzword, support for this approach, once it becomes clear that preparation and implementation involve a significant institutional financial commitment, may be less than enthusiastic.

We also must recognize that there are very real limits to what can be accomplished in a single course. Undoubtedly, this approach to teaching in the social sciences works best in a system that requires all students to

take an introductory course in informal logic or practical reasoning and where there is an institutionwide commitment to teaching thinking skills across the curriculum. Isolated instruction can have an impact, but its effect is diminished by lack of reinforcement.

Finally, we all have to be concerned with assessment both of the value added to our courses and of our students' understanding of the disciplines that we teach through incorporation of thinking skills instruction into the social sciences. Current assessment procedures fall short of what is required. A standardized thinking skills inventory, independent of subject matter, given at the beginning and conclusion of a course can tell us if students have improved abilities to perform such operations as drawing correct and appropriate inferences or conclusions from observed or supposed facts, recognizing assumptions implied by given statements, and recognizing the form of and evaluating the strength of arguments that they encounter. Similarly, standardized discipline-specific tests, such as the Educational Testing Service's advanced placement exams for American History, can tell us if students have learned a substantial body of basic factual information. What we need to find are instruments, yet to be devised for each teaching area, that can measure the intellectual growth that occurs when students combine learning with the appropriate tools for understanding.

Despite the acknowledged problems, there are benefits to be derived from a critical thinking approach to teaching our courses. When we help students develop their thinking skills, we empower them and make them equal partners in the business of learning. If we want them to become autonomous, lifelong learners, we must help them sharpen the skills that are needed to achieve this goal. We cannot teach them the answers to questions; instead, we must teach them how to decide what questions should or could be asked. A democratic society requires a citizenry that is able to make informed choices among competing claims. Our educational goal of preparing students to make these choices is legitimate and desirable.

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CAROL LYNN H. KNIGHT is professor of history at Tidewater Community College, Chesapeake, Virginia.

Establishment of critical thinking as an integral part of an institution's curriculum can help renew the faculty's spirit and excitement about teaching and learning.

The Critical Literacy Seminar: A Faculty Development and Rejuvenation Strategy

Margaret B. Lee, Trudy H. Bers, Richard Storinger

In the past decade a great deal of public and pedagogical attention has been paid to critical literacy—to developing in students the ability to apply *reflective skepticism* within the problem area under consideration (McPeck, 1981). Usually, the success of a critical literacy project (CLP) is judged by the improved ability of students to think critically, to write, and to learn. While students' educational achievements are certainly the ultimate target of the CLP at Oakton Community College, the project has more proximate goals as well: greater knowledge about critical thinking and improved teaching by the faculty. In pursuing a project to attain these goals, Oakton found that another, only dimly anticipated but vitally important benefit grew out of the project: the revitalization of the faculty.

Looking back, we can point to critical decisions in shaping the project that led to faculty regeneration. In this chapter, we discuss some of those decisions and suggest ways that other institutions might develop similar projects.

The College

Oakton Community College is a comprehensive, open-enrollment institution with ninety-five hundred students in credit courses and another ten thousand students in adult and continuing education. At Oakton, nearly 80 percent of the credit students attend school part-time, 65 percent of them in transfer curricula. The average age of students is twenty-eight, with 55 percent below the age of twenty-five. Over 90 percent are employed. More students are reverse transfers, having attended another

college or university before coming to the community college, than are first-time college students.

One hundred and fifty full-time faculty and close to four hundred part-time faculty teach in the credit programs. The majority of the full-timers have been at the college for over a decade. Their current average age is forty-eight, and each year the average age rises by one year. Most faculty members plan to remain at the college until they retire, with the bulk of the retirements more than five years away. Consequently, a significant challenge for the institution is to ensure that faculty members remain professionally vigorous, current in their disciplines, and committed to high-quality teaching.

The Critical Literacy Project

Oakton's CLP, a faculty development program now in its fourth year, had a number of antecedents that cultivated faculty interest in critical thinking and writing across the curriculum and, in fact, led to the informal creation of a broadly representative group of faculty members who provided the core leadership for the project. These antecedents included the participation of a faculty member in the Workshop on Writing at the University of Iowa, sponsored by the National Endowment for the Humanities in 1980; another key person's attendance at one of the University of Chicago's annual workshops on critical thinking; an on-campus seminar on the teaching of writing for an interdisciplinary group of faculty members; the implementation of a holistically scored placement system in composition that recruited essay readers from outside the English Department; and an interdisciplinary faculty study group that explored the theory and pedagogy of critical thinking. This study group worked intensively to design the CLP and to obtain start-up funding for it through a two-year grant from the U.S. Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE).

The CLP, which has come to occupy the heart of Oakton's faculty development program, has three major components: the Critical Literacy Seminar, all-college staff development programming, and sponsorship of a national conference. The seminar, the key to faculty revitalization, is a year-long faculty-designed, faculty-taught seminar for the faculty, offered annually since 1986, with registration limited to twenty volunteers each year. Fifty-three of Oakton's 150 full-time faculty members, representing twenty-five baccalaureate and vocational disciplines, have completed the seminar so far. Since 1989, half of the seats have been reserved for senior part-time instructors, and the college has committed to offering the seminar each year for as long as faculty interest in participation continues.

The seminar, which is quite demanding and intellectually rigorous, is designed to help faculty members incorporate instruction in critical literacy skills—critical thinking and analytical reading and writing—into their course content. The first semester covers the theoretical ground, with exten-

sive reading, writing, and discussion, and lectures by outside and in-house experts; the second semester adopts a collaborative workshop format in which participants are required to modify at least one of their courses to incorporate what they have learned—in effect, to rethink and to reinvent the ways in which they teach—with the expectation that they will revise their other courses similarly after the seminar is completed. In addition, seminar participants are required to work individually with three faculty consultants during the year: a reading instructor, who advises on reading interventions appropriate to the particular texts and discipline; a curriculum design specialist, who assists in reconstruction of the syllabus and patterning of the assignments; and a teaching improvement specialist, who observes and videotapes classes, surveys students, and works extensively with the instructor to improve classroom methodology, paying particular attention to the teaching of critical literacy skills. (Note that since this chapter was originally written, the seminar has been rescheduled from a regular semester to the summer. This change has enabled high school faculty members to join the seminar and has opened it to faculty members who are unable to clear their schedules for weekly meetings during the regular academic year.)

Many of the early participants in the seminar were from the "first tier" of Oakton's faculty—those who are most widely respected as the best and most committed teachers and who have the greatest influence on their colleagues. As a result, many other faculty members have been indirectly touched by the seminar. A few have entered into a healthy "competition" with the seminar, doing in-house presentations on topics related to those covered in the seminar.

The Elements of Success

We believe that a number of aspects of the CLP have contributed to its success. First, the CLP is a *faculty-owned* project. It was initiated by the faculty study group, which designated itself the steering committee and selected the project's faculty coordinator, and it continues to be planned and organized by subordinate committees. Each year the steering committee appoints a seminar-planning committee and a conference-organizing coordinator and committee, the membership of which changes slightly each year. Thus, the project remains flexible in response to the needs of those who are currently involved in it, while retaining certain fundamental elements that established its original success.

Second, the CLP is *supported by the college*. Initially, the FIPSE grant provided most of the financial support for the CLP, although the college doubled its intended matching support to encourage faculty involvement with released time for participation in the seminar. The enthusiasm has remained so great that when the grant ended, the college agreed to con-

tinue financial support at the same level. This support means that faculty who participate in the seminar can have this participation count toward their teaching load or receive a course overload stipend. It also means that the institution provides clerical support, space, and a great deal of visibility for the program and its participants. The dollar cost has been considerable, but the extent of the benefits in teaching and learning is incalculable.

Third, the CLP is truly *interdisciplinary*. Although in the past it was members of the English Department who started most of the "seed" activities, the CLP has never been organized or perceived to be an English Department project. Participants in the first three CLP generations came from both transfer and career programs, involving twenty-five different disciplines. Among the most interesting elements of the program are those that require faculty members to incorporate the contents or techniques of another discipline into their own. For example, one nursing instructor drew parallels between Shakespeare's characterizations of people in various age groups and contemporary descriptions of stages in the aging process. The similarities were remarkable.

Fourth, the CLP blends *rigorous intellectual efforts, hands-on experiences, and exuberant fun*. The planning committee structures the seminars to include intensive examinations of material about the topic of discussion, experiential learning exercises so that participants can try out different teaching and learning techniques, and time for socializing and even silliness. Seminars typically begin with a lunch, subsidized in part by the college and often provided by two participants for the rest of their colleagues. The social aspects of the CLP have undoubtedly contributed to participants' commitment.

Fifth, the CLP brings together instructors who barely know each other, resulting in new collegial relationships and a *more cohesive faculty*. Among the unplanned but extremely positive outcomes of the CLP is the development of professional and friendship ties among faculty members who, prior to their involvement in the CLP, were scarcely acquainted. Through their shared experience, they develop links that persist beyond the CLP year and knit the faculty together through new and more substantial professional relationships and friendships.

Sixth, the CLP provides a *context within which faculty members can perfect and use specific expertise* regarding teaching and learning. In a recent study of midcareer humanities faculty members at a large urban university, Caffarella, Armour, Fuhrmann, and Mergin (1989) discovered that many faculty members had created special niches for themselves, enabling them to devote energy and time to professional activities that were not necessarily part of what they were originally hired to perform. At Oakton, a number of CLP participants have created such niches, becoming experts in specific approaches to teaching and learning and sharing this expertise not only with their colleagues at the college but also as consul-

tants and presenters at conferences. For example, one member of the counseling and social science faculty has become an expert in collaborative learning and works with other faculty members to design assignments that build collaboration into the implementation of the project. Another person, a reading specialist, has become knowledgeable about learning style inventories, particularly the Myers-Briggs Inventory, and shows colleagues how to assess students' learning styles and how to adapt their teaching approaches to complement these styles. One art instructor who was invited to present his workshop on the effective use of the blackboard at Oakton's first conference has since received an astonishing number of invitations to take his act on the road to neighboring colleges and high schools. The development and use of and recognition for their expertise have provided significant stimulation for faculty members and reduced the likelihood of boredom with their work.

And, seventh, the CLP has brought *credibility to the college as an institution for serious teaching and learning.* Although difficult to measure objectively, there is a strong perception internally that the CLP has been a catalyst in bringing increased credibility to the institution as a place where teaching and learning are taken seriously. This credibility, in turn, has fostered a sense of professionalism and competence among faculty and staff, a feeling of self-confidence that they are doing the right thing and doing it correctly.

At base, as the project's faculty coordinator says, the CLP is about *faculty empowerment.* The coordinator, from the beginning the CLP's guiding genius and philosopher, points repeatedly to the achievement of that objective as the central element of the project's success. Aside from the provision of the resources, the CLP is not something that the administration "does for" the faculty. Indeed, several colleges with whom our faculty have worked have been unable to implement anything like our CLP. In each case, the intended project was championed overenthusiastically by an eager, well-intentioned administration but lacked natural ties with or support from the faculty.

At Oakton, the faculty members take responsibility for themselves and the project. They commit to an idea, actively encourage each other to follow interests and to develop their expertise, and work to build a climate in which expertise is acknowledged and used not just in the relative privacy of the classroom but on a larger stage as well. That kind of active involvement is what makes the CLP an ideal faculty development program.

In sum, there are many factors that have contributed to the success of the CLP at Oakton. Some of them, for example, faculty leadership, were designed into the program at the outset. Others became clear only as the project proceeded, and as increasing numbers of faculty members participated directly in it. Some factors, such as creation of a context in which faculty develop expertise, can be structured. Others, such as the good

chemistry that develops among participants, cannot be guaranteed but are more likely to occur with a random mix of people, and care can be taken to design opportunities to build interpersonal ties.

What Other Institutions Can Do

The CLP described here evolved over time and has continually been refined by the experiences of previous participants and by the interests and concerns of the individuals most immediately involved. It is extremely unlikely that another institution could replicate the ingredients of Oakton's project and hope for similar results, for such things depend on the particular mix of circumstances and personalities. Consequently, as other institutions think about developing similar projects, it is important that they begin by focusing on the explicit interests of small, energetic, committed groups of faculty and encourage them to build on these interests and take the lead in establishing more expansive projects that "fit" the particular institutional climates.

There is no "right way" to initiate and support a faculty revitalization project. For Oakton, the CLP has been successful far beyond our expectations. The key benefit has been the revitalization of the faculty members who have participated in the project. Seminar alumni speak consistently of the regenerating effects of taking time in midcareer, when energies and creativity have begun to fade, to rethink what they do in the classroom on a very basic level, to arrive at a new understanding of the teaching process, to try new approaches, and to be inspired to new efforts by the improvements that they see in their students' ability to learn.

Even though we did not anticipate the scope of the benefits, faculty revitalization was never a primary reason that the project was initiated, nor is it a primary reason for the continuation of the work. The CLP was and is a program that targets teaching and learning, that offers participants opportunities to improve their knowledge about teaching and learning and their practice of teaching and learning. It is a program that sits at the heart of the mission of a community college. It is as mainstream as a program can be, and it rests on the talents of people within the institution, not on the talents of outsiders brought in for short-term consulting. Thus, perhaps the most important advice we can offer to other institutions is to encourage a project that is imbedded within and evolves from the faculty, rather than grafted onto it.

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MARGARET B. LEE is vice president of curriculum and instruction at Oakton Community College, Des Plaines, Illinois.

TRUDY H. BERS is senior director of institutional research and curriculum and strategic planning at Oakton Community College.

RICHARD STORINGER is dean of the Communications Division at Oakton Community College.

The same strategies that one uses to be a good teacher, in general, also apply to the teaching of critical thinking.

Great Teaching, Great Learning: Classroom Climate, Innovative Methods, and Critical Thinking

Lawrence P. Litecky

In 1989, Ernest Boyer, the president of the Carnegie Foundation for the Advancement of Teaching, spoke on a radio broadcast about the state of American higher education. In a question-answer session, someone asked, "Based on your research, what makes for a great teacher?" Boyer responded, "When I look back at great teachers of mine, they share three characteristics. First, they know their subject matter. Second, they know how to teach and use innovative teaching methods. Finally, they are 'real' people. They bring the same zest and enthusiasm to teaching and to life."

Community colleges can draw a lesson from Boyer's observations. The primary mission of the community college is teaching—beyond the demands of service and research. Any attempt to improve community colleges must focus on the improvement of teaching and learning. To achieve this goal, faculty must go beyond subject matter expertise. Boyer's characterization of great teachers demonstrates the need to explore how to teach with a variety of methods and how to make the most of interpersonal dynamics in the classroom climate.

College faculty, when beginning their teaching careers, emulate their college professors. For the vast majority of new faculty who teach American undergraduates, this emulation means lecturing. Teaching equals lecturing, and better teaching equals better detail and better illustrative episodes in lectures.

I do not intend here to argue against the lecture as a teaching method. Lectures remain the cornerstone for the dissemination of information—a

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key function of education. In linking the lecture to Boyer's three characteristics, I contend that the lecture can demonstrate subject knowledge, which is a necessary but insufficient route to great teaching. Lectures are linked to one function and one method. If no other method of teaching occurs, then the odds increase that students will become passive. Recall constitutes the focus of this teaching style. Students become receptacles of information given to them by the narrating lecturer.

Critical Thinking and Active Learning

Critical thinking as an intellectual goal, with its pedagogical implications, stands in contrast to this passive recall style of learning. Critical thinking is the active, mental effort to make meaning of our world by carefully examining thought in order to better understand content. Critical thinking stands at the core of the liberal arts tradition. More than any other attribute, critical thinking defines the liberally educated person and constitutes the heart of higher education's mission. I want to focus on three aspects of critical thinking: making meaning of our world, examining thinking carefully, and exerting active mental effort.

In making meaning of our world, in thinking critically, the individual recognizes the importance of content and cultural information. Thinking takes place in a context, and mastery of subject matter informs that context. Ideas require definition of background information and a shared basis of fact, symbol, and tradition. Careful examination of thinking includes the exploration of thinking abilities from generative ideas to exploration of evidence, from analysis of assumptions to evaluation of conclusions.

Faculty have long had a hidden agenda in their disciplines. That hidden agenda is a hope that students will think well, in addition to achieving subject matter mastery. Critical thinking stresses the attainment of higher-order thinking skills by making them a more overt part of the curriculum. Utilization of a model of critical thinking within the curriculum helps student comprehension. Models can stress the skills of gathering information, drawing inferences and conclusions based on evidence, examining assumptions, analyzing ideas and arguments, and generating various theories. Models can focus on a particular discipline or deal more generally with the operational characteristics of good thinking. Active mental effort provides the best link to the teaching of thinking—the need for strategies that put students into the role of active thinkers.

Adler's (1984) model, the Paideia Program, explores critical thinking and the multiple dimensions of desired learning in educational settings (see Table 7.1). This model is helpful in differentiating acquisition of knowledge from the development of intellectual skills and the enlarged understanding of ideas and values. Column 2 most clearly parallels the heart of the critical thinking movement. In developing these learning skills, students

Table 7.1. Critical Thinking and the Multiple Dimensions of Learning

	Column 1	*Column 2*	*Column 3*
Goals	Acquisition of organized knowledge	Development of intellectual skills, skills of learning	Enlarged understanding of ideas and values
	by means of	by means of	by means of
Means	Didactic instruction, lectures and responses, textbooks, and other aids	Coaching, exercises, and supervised practice	Maieutic or Socratic questioning and active participation
	in three areas of subject matter	in the operations of	in the
Areas, operations, and activities	Language, literature, and the fine arts	Reading, writing, speaking, and listening	Discussion of books (not textbooks) and other works of art and involvement in artistic activities, for example, music, drama, and visual arts
	Mathematics and natural sciences	Calculating, problem solving, observing, measuring, estimating	
	History, geography, and social studies	Exercising critical judgment	

Note: The three columns do not correspond to separate courses, nor is one kind of teaching and learning necessarily confined to any one class.

Source: Reprinted with the permission of Macmillan Publishing Company from *The Paideia Proposal: An Educational Manifesto* by Mortimer J. Adler. Copyright © 1982 by the Institute for Philosophical Research.

need to be active in practicing these new ways of thinking and in obtaining feedback.

When faculty seek to involve students and make them more active, writing and speaking are cornerstone activities. While there is no magic potion for good teaching and learning, the emphasis on making the students active is essential. Cole (1982) reviewed more than three hundred books and articles on improving instruction. He concluded that "learning is more effective when the student actively participates in the learning experience" (p. 49).

Active Learning and Innovative Teaching Methods

Innovative teaching methods often actively involve students. Two chief ways of actively promoting thinking are through writing and speaking. In assigning writing and speaking activities, faculty can gain more than the fragments of thought typically expressed by students. In structuring concrete classroom activities, faculty can focus on the thinking of the students. Exploration of definitions, meaning, assumptions, and evidence can stem from well-structured activities, and students can be asked to draw and justify their own conclusions—outcomes at the heart of critical thinking (Kurfiss, 1988).

An example from my Introduction to Philosophy class illustrates the possible shift in teaching methods. The first time that I taught this course, I relied on lectures, illustrations from my own experience, and interspersed questions. When I began a unit on ethics, I would ask the whole class, "What do we mean by goodness?" After a brief pause, a few eager students would raise their hands, and I would select one. In this teaching method, I would lecture for forty minutes and five or six students might respond for ten minutes.

In attempting to create more active participation among students, I came up with a different format for a fifty-minute class period. Now, at the start of the unit on ethics, I use seven minutes to introduce the topic in general and describe what will take place for the balance of the period. I then put a discussion statement on the board and ask the students to write for five minutes in response. For this unit, a typical discussion statement is the following: "Good is merely a matter of taste. If a person prefers something, it's good. We all have different preferences. Do you agree or disagree? Why or why not?" Following the five-minute writing period, I ask students to form groups of three or four to discuss their written responses. This discussion in small groups lasts six to eight minutes. These groups usually do well in discussion since there is time to consider the issues during the prior five-minute writing period. Nearly everyone writes thoughts worth expressing verbally. The discussion establishes a context in which students can learn from each other. Respect for each other's thinking aids the devel-

opment of skills in listening as well as in speaking. Another benefit from these exercises is the social camaraderie that grows when members of a group get to know each other.

At the end of this period of small group discussion, I ask for comments from the groups. Typically, many students volunteer insights from their writing and discussion. Since everyone writes for five minutes and then participates in the small groups, students can be called upon in a fair context. The students' comments provide the basis for an exchange in critical thinking. I ask those in disagreement with the discussion statement to give their reasons and evidence. Then I ask for those in agreement with the statement to give their reasoning. This exchange typically lasts ten to twelve minutes.

As is the case in most exchanges between students and faculty, this period of comments from the groups calls for judgment by the faculty member. When should one be gentle to students who are learning to share their thinking? When should one challenge students who are stuck or lazy in their thinking? The practices of exercising appropriate judgment and using an appropriate style are at the core of the interpersonal dimensions of good teaching.

In this dialogue between students and faculty lies a potential link between critical thinking and innovative teaching. Exploration of definitions, language use, assumptions, evidence, reasoning, and conclusions cultivates the best habits of the mind. When faculty, whether in community colleges or graduate schools, aspire to achieve this level of innovative teaching, they aspire to achieve the best in critical thinking and in the liberal arts.

After processing and exchanging comments with students, based on their writing period and discussion groups, I lecture for eight to ten minutes and, in this time, attempt to provide a very brief overview of key thinkers on the questions considered, references to the required readings, and links between these sources and the students' comments. I also ask for questions.

Next, I show a five-minute videotape excerpt of Mortimer Adler discussing the idea of goodness with Bill Moyers in the PBS series "Six Great Ideas." In this short excerpt, students see a major contemporary thinker modeling the critical thinking process. This activity also affirms the value of the students' thinking. In their own way, the students have engaged the same issues that Adler considers on the videotape.

For the final few minutes of the class, I take any remaining comments on either the Adler videotape or on previous issues. This class method incorporates a variety of strategies that makes students more active and allows for different learning styles to flourish.

Teaching Excellence, Faculty Personality, and Classroom Climate

Many of those who research teaching and learning note the importance of the personality of the teacher. The best teachers "seem capable of change, curi-

ous about innovations, quite ready to criticize themselves and join the search for better procedures and more satisfying outcomes" (Martin, 1981, pp. 151-152). The shared personal characteristics of great teachers abound: caring, sensitive, likable, humble, and enthusiastic. Feigned humor, caring, and sensitivity come across as hollow. It is impossible to fake or imitate the kind of enthusiasm that demonstrates a teacher's belief in the intrinsic worth of teaching. To ignore the importance of the personality of the faculty member is thus to ignore the obvious. If teaching is a faculty activity intended to facilitate learning by students, then the characteristics of the teacher merit attention.

With these caveats, it is important to explore the educational domain from the affective perspective. What motivates students? What can be done in the climate of the classroom to enhance motivation?

James Stuckey of Prescott College, one of my colleagues and a team-teaching partner, concluded that three elements were crucial to excellence in teaching and learning: quality of effort, time on task, and knowledge of results. While these factors are typically discussed in terms of students' learning behavior, they are equally applicable to the faculty's teaching behavior toward students when one attempts to interpret the classroom climate.

From the perspective of quality of effort, a sense of identity and belonging often motivates students to participate, to get active and learn. As the course proceeds, growth in faculty knowledge of students as individuals can provide a basis for differentiating among them so that appropriate faculty-student interaction can occur.

The second element of classroom climate that is critical to achieving excellence in teaching is time on task. Time on task is a key measure of commitment to many activities. It can be assumed that the faculty member has previously devoted time to mastering the content of the course. Beyond this investment, time on task has both in-class and out-of-class dimensions, including preparing adequately for class, being accessible to students, conducting research, reading to keep up to date in the field, and allowing adequate time for grading tests and assignments.

The third element for analyzing teaching excellence and classroom climate involves sharing the knowledge of results with students. Four behaviors make up the key dynamics: return papers and tests with detailed comments, return papers and tests in a timely fashion, meet with students individually, and obtain student feedback.

Improvements in teaching and effective teaching of thinking depend in part on the personality of the faculty member. While attributes such as caring, sensitivity, likability, humanity, a sense of humor, and enthusiasm influence the teaching-learning process, they are central to personal character and are formed over a lifetime. Appropriate exercise of these attributes is an art and at the core of anyone's identity, including that of a faculty member. However, there are behaviors within the climate of the classroom that demonstrate faculty commitment and excellence. These

behaviors indicate to students the quality of faculty effort and the time devoted to teaching and to sharing the knowledge of results of the educational process.

Critical Thinking Strategies

In addition to faculty attributes and behaviors that create classroom climates conducive to learning, it is important to consider practical teaching strategies that promote critical thinking. With the potpourri of strategies presented here, I attempt to link all three of Boyer's earlier mentioned traits of great teachers: subject matter mastery, competence in how to teach, and interpersonal engagement. The key dimension in these strategies is the focus on the active role of students in the learning process. The examples draw largely on my experience in social science and humanities teaching, but they could be adapted to other areas of the curriculum.

"Five-Minute Write." I try to formulate the key question for a classroom session. What is the dominant idea behind the information for a given unit? I write this out prior to class and, at an appropriate time in the class, put it on the board. I then ask students to write for five minutes on the question.

Panel Presentations. I favor student panel presentations in my classes. Organized student presentations give students a chance to improve their competence in oral communication—a competence that all students should achieve. Organized speaking is an active learning strategy and emphasizes student thinking.

Videotape Excerpts. Videotapes offer faculty an opportunity to supplement lectures in a medium that is more flexible than film. Short excerpts can be isolated on videotape to illustrate key points. These excerpts can provide bases for examining the thinking process.

Discipline Worksheets. Students can be given worksheets that ask them to identify specific theories in courses in terms of origin, evidence for each theory, relationship to other theories, and consequences of each theory. With this technique, students gain a sense of the structure and framework of the discipline—how information is organized and prioritized, and the key questions and issues of the discipline.

Assignments. Specific assignments can be designed to structure students' examinations of evidence, hypotheses, and judgments. These kinds of assignments can build a critical thinking modality into student writing assignments. They can also be used as the basis of lectures and discussions.

Assignment Interviews. Students can conduct structured interviews with people in the community. The interview format puts students in an active position of conversing and analyzing. When the interviews are tied to written papers, students have the opportunity to exercise and blend their speaking and writing abilities in a critical thinking assignment.

Seminar Presentations. In small sections of honors classes, students read primary source materials. They then structure their discussion on the basis of the texts and attempt to understand the ideas of the author by referring to excerpts of writing.

These seven strategies are, in effect, a menu of practical methods for mastering subject matter. Faculty need to implement these strategies in supportive classroom climates and call forth "active learning."

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LAWRENCE P. LITECKY is president of Minnesota Community College Faculty Association, St. Paul, Minnesota.

It is important that we learn to create and evolve effective critical thinking programs in community colleges and to maintain teacher accountability.

Forced to Think: The Title V Mandate in California

John Feare

Strengthening the Associate Degree

Critical thinking has always been one of the primary objectives of liberal education and has been advocated by philosophers of education of various persuasions. Nearly a century and a half ago, John Stuart Mill lauded not only critical thinking but also, in particular, *self*-criticism, an essential aspect of critical thinking that has been and continues to be neglected. Mill (1947 [1859], p. 20) opined that human beings can become wise only by openness to criticism of their own opinions and conduct, by listening to and evaluating all that is said against them, and by studying "all modes in which [a question] can be looked at by every character of mind." In our own day, Brazilian educator Paulo Freire (1971, pp. 80–81) stressed the dialectic between critical thinking and action and between critical thinking and dialogue, remarking that "true dialogue cannot exist unless the dialoguers engage in critical thinking . . . which does not separate itself from action."

Critical thinking has come to the fore in California as a result of statewide concerns regarding the credibility and viability of the associate degree (A.A. or A.S.). On the one hand, there was the concern of faculty, expressed by their statewide organization, the Academic Senate for California Community Colleges, that the degree was losing its credibility because the broad range of skill levels among students made it impossible to teach "at the college level," and, on the other hand, there was the concern of the public, which was calling on schools and colleges to improve the quality of the intellectual and character development of their graduates. In response

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to these concerns, the final report of the statewide Task Force on Academic Quality (equally composed of faculty and administrators) culminated a five-year, multidimensional investigation into how the associate degree could be strengthened *and* access and quality guaranteed through the processes of academic standards, matriculation, and remediation. This effort was the keystone of the subsequent review of the Master Plan for Higher Education and the preparation and passage of Assembly Bill 1725 in 1988.

Prior to the attention given in the 1980s to strengthening the associate degree, the only reference in the California Education and Administrative Codes to critical thinking as an educational objective was the provision that for courses in the social and behavioral sciences to satisfy general education requirements, the courses had to be designed "to stimulate critical thinking about the ways people act and have acted in response to their societies." Although this was the sole direct reference in the codes, the Board of Governors, in its Policy Statement on Statewide Community College Mission of December 9, 1983, did at least recognize the central role of critical thinking in general education by stating that all courses in that area of the degree should be designed to develop "analytical ability and critical thinking." Note that the board made a distinction between "analytical ability" and "critical thinking."

Title V Mandate

In November 1988, the final version of Course Standards Regulations of the Administrative Code (Title V) was approved. In May 1985 and in September 1986, the Board of Governors adopted regulations designed to strengthen the associate degree, but local and budgetary factors delayed their adoption by the Office of Administrative Law until 1988. The mandate for critical thinking is contained in one sentence in Section 55002(a)(2)(F): "Difficulty. The coursework calls for critical thinking and the understanding and application of concepts determined by the curriculum committee to be at college level." Thus, the requirement of students to think critically became one of seven standards on which colleges can recommend courses as appropriate to the associate degree.

College and district curriculum committees have been assigned the tasks of, first, defining the terms *college level* and *critical thinking* and then of reviewing, revising, and categorizing every course in the curriculum as either an associate degree credit course or a nondegree credit course. The coursework of the former calls for critical thinking and the understanding and application of concepts determined by the curriculum committee to be at college level, a process that over half of the community colleges have already completed.

Finally, the chancellor's office does not review each course but does review and certify "the procedures by which colleges are classifying courses"

(Glock, 1987, sec. 1, p. 2). Curriculum committees and district governing boards must submit to the state chancellor's office lists of courses that have been deemed "collegiate" and that, therefore, can be counted among the minimum of sixty units required for granting the associate degree.

What Is Critical Thinking?

Colleges have approved or will approve courses as "college level" and as "calling for critical thinking" without any standardized, statewide definitions of those terms, since the task of both defining the terms and approving or disapproving courses in relation to those definitions has been left to local curriculum committees. Colleges that had not completed their work by fall 1987 benefited from the *Course Standards Handbook* (Glock, 1987), prepared by the Educational Standards and Evaluation Unit of the chancellor's office. In the part of this document that was intended to have prescriptive legal force, Glock (1987, sec. 4, p. 5) assumed that even though there would be great variance from college to college in their working definitions of critical thinking, and even though some curriculum committees might delegate to departments the responsibility of defining critical thinking, the definitions "will all nonetheless be recognizable as 'critical thinking.' " In this section, she lists specific reasoning skills that can serve as operational criteria: analyze, explain, deduce conclusions, identify, anticipate, or pose problems, synthesize, evaluate, diagnose, compare and contrast, justify, apply principles, and solve unfamiliar problems.

In the section of the handbook designed in "an effort to create a common reference point statewide for discussion and implementation" (Glock, 1987, sec. 1, p. 1), Glock thoughtfully discusses various aspects of critical thinking: definition, setting of objectives, assessment of competencies, curriculum planning, and instructional strategies. To serve the purposes of educational policy, instruction, and assessment, she proposed the following "programmatic definition," which describes the referent and "takes into account what the practical implications would be of choosing one definition over another": " 'Critical thinking skills' are (a) those diverse cognitive processes and associated attitudes, (b) critical to intelligent actions, (c) in diverse situations and fields, (d) that can be improved by instruction or conscious effort" (sec. 8, p. 9).

Note that Glock has defined not "critical thinking" but rather "critical thinking skills" by delineating the characteristics that any skill must have if it is to be an instance of critical thinking. Note also that in this definition attitudes have become skills, and critical thinking skills have become crucial thinking skills. This use of the word *critical* to denote "crucial" is highly controversial to those for whom "critical" in "critical thinking" *always*, and at least, denotes skillful, reasoned judgment about merit or worth in issues of serious concern.

The handbook contains a wealth of provocative ideas about college-level, operational criteria for defining and implementing critical thinking, including implications for curriculum, strategies for instruction, and assessment for competencies. The attitudes and values that Glock recommends separate the critical thinkers from the sophists: "tolerance, playfulness, courage, patience, persistence, openness, honesty, and the willingness to be self critical . . . in order to meet standards of truth, justice, caring, beauty, effectiveness, and efficiency" (1987, sec. 8, p. 23).

If, as Glock argues, critical thinking is not just the sum of skills, it would be better to define critical thinking by detailing its components (for example, abilities, attitudes, and values), the abilities, attitudes, and values that are essential to the process (for example, detection of fallacious reasoning, empathy, pursuit of truth), and its primary purpose (for example, guidance of our thoughts, beliefs, and actions). With this kind of detailed definition, the task of figuring out how to cultivate critical thinking and how to measure the success of the effort could be undertaken.

Implementation at the College Level

Within the frame of reference of Glock's (1987) handbook, local curriculum committees have been establishing and implementing their procedures for defining critical thinking and approving courses in which it can be fostered. What kinds of definitions have been established by these campus and district curriculum committees? My random sample of sixteen of the colleges that submitted procedures to the state chancellor's office by March 1989 reveals that the vast majority confined critical thinking to reasoning skills for application to academic purposes. Only two colleges mentioned a connection between critical thinking and beliefs, ethical purposes, and attitudes such as empathy and fair-mindedness. Clearly, a relationship exists between the kind of inquiry into critical thinking that a college conducts and the kind of definition that emerges. For example, Cuesta College in San Luis Obispo engaged Richard Paul, director of the Center for Critical Thinking and Moral Critique at Sonoma State University, California, as a consultant, and his influence is apparent in Cuesta's definition, especially in its reference to self-criticism and fair-mindedness.

Based on a review of plans already submitted and on my own discussions with curriculum committee members on what has and has not worked, the following recommendations are offered for the consideration of colleges that intend to establish campuswide programs in critical thinking.

Assign the Project to a Responsible Committee. All members of this committee, whether an existing or a newly formed task force, must be interested in critical thinking and enthusiastic about its infusion throughout the curriculum and, ideally, beyond the curriculum into the overall intellectual fabric of the campus. If this holistic approach is what those who

establish the committee's scope (whether faculty or administrators) have in mind, then in the best spirit of shared governance all campus constituencies should be represented on the committee, even though in California the curriculum committee ultimately certifies that courses are college level, approves curriculum changes, and informs the chancellor's office of this certification. The composition of the committee has implications for the task of convincing all segments of the campus community of the merits of the program. The committee should be charged with the planning of the project, its implementation, and its evaluation and refinement. Given the usual workload of standing committees, the establishment of a special committee would seem warranted if the college wishes to accomplish more than mere minimal compliance with the state mandate.

Study and Consult. Committee members should familiarize themselves, whether through reviews of the literature or the aid of consultants, with the expansive approach to critical thinking of the last decade, as exemplified by the work of Richard Paul. This investigation should be done *before* the future course of the committee is determined so that members have a multidimensional view of the subject.

Provide Released Time or Extra Pay to a Coordinator. One especially enthusiastic and knowledgeable member of the committee (for example, the chair) should be given the time, resources, and incentive needed to steer the committee and the campus through the craggy yet exciting project.

Define Critical Thinking. The scope of the definition determines the scope of the project. The definition should be framed so that it serves as a clear and comprehensive guide during all phases of the implementation of the project. Ample time should be taken here so as to preclude later confusion over what critical thinking *is*. A statewide definition, formulated by a task force representing all campus segments, is helpful as a minimum standard, but some campuses will want to have their own, more comprehensive definitions.

Set Objectives. The committee must be clear about its objectives and how it intends to fulfill them. In the case of the Title V mandate, it must determine just what kind of evidence is required from departments to verify that their courses call for critical thinking in sufficient quantity and quality so as to comply with the local and statewide definitions.

The committee must have the courage and authority to ensure the authenticity of the process. For example, a department should not be permitted to simply declare that its courses call for critical thinking without demonstrating exactly *how;* nor should the committee be satisfied that critical thinking is achieved simply because students are required to, say, estimate, summarize, and compare.

The primary objective of a comprehensive critical thinking project is to change human behavior and character by creating environments and structures through which students, classified personnel, trustees, adminis-

trators, and faculty become increasingly better critical thinkers. Accordingly, it is imperative that they be thoroughly involved and informed throughout the process via workshops and bulletins.

Probe Implications for Curriculum and Instruction. The old French adage "the more things change, the more they remain the same" surely applies to critical thinking if change is not effected in what is taught and how it is taught. Relevant questions for consideration include the following: Should there be a special requirement in general education called *critical thinking*, with the course options limited to those that concentrate on involving students in the full range of components of critical thinking (abilities, attitudes, values) contained in the college's definition? Should critical thinking be taught in special courses as well as across the curriculum, much in the manner of writing? Will some amount of content have to be sacrificed in order to provide time for students to *practice* the components of critical thinking that are presented? How much critical thinking is called for by the typical lecturing, note taking, and testing method? Are Richard Paul and Paulo Freire correct in their assertion that if the classroom exchange is not dialectical and dialogical, something other than critical thinking is going on? Can critical thinking competencies be assessed only on Scantron tests? Is the best way to foster critical thinking to have educators and staff model it in daily interaction with students, in and out of the classroom, as is done at Gavilan College?

Pedagogical Implications

Based on my review of how colleges are experimenting pedagogically and on my own experience, I offer these answers to some of the foregoing questions. Critical thinking should be taught across the curriculum *and* in courses specifically designed to promote the full gamut of critical thinking objectives. This strategy is, after all, what we pursue for composition and oral communication. Critical thinking is crucial enough to warrant a separate category in general education, in which are found only specially designed courses. We should do no less for critical thinking than we do for writing, speaking, and computing.

Students must have ample opportunity to *practice*, in class and in homework, what we want them to learn. John Dewey's dictum about the value of learning by doing is fully applicable here. For example, students evaluate better if they are called on to prepare and present evaluations to be critiqued by the other students and the instructor; students better understand points of view different from their own, and they gain different perspectives on their own points of view, if they have the opportunity to prepare and present for critique the best arguments that they can muster for those other viewpoints. In this process the teacher is essentially a facilitator of learning, not simply a disseminator of information. After all, telling is not teaching.

The traditional lecturing, note taking, and testing method must be replaced by demonstration, participation, and discussion not only because the former promotes student passivity and faceless anonymity and inhibits critical thinking but also because it places at a disadvantage the many visual and kinesthetic learners found in every classroom. Everything that can be said in a lecture can be distributed in writing, to be read between class and then discussed, elaborated on, and worked on in class. If large lecture sections are used, then some small group work must be provided in which students are prompted to raise their own questions about the subject and not simply respond to questions raised by the instructor or textbook. After all, critical thinking is nothing if it is not questioning, questioning, questioning.

Affective Dimension

Here I consider a crucial aspect of this subject that we ignore or minimize to our detriment: the affective dimension of critical thinking. Feelings can make an invaluable contribution to high-quality critical thinking. Consider the logic of this argument: Critical thinking includes attitudes and values; attitudes and values have strong emotional content; therefore, emotions are inherent to critical thinking.

One of the leading thinkers, authors, and teachers in the field of critical thinking, Vincent R. Ruggiero, has observed that "feeling and thought are perfectly complementary. Feeling, being more spontaneous, is an excellent beginning to the development of conclusions. And thought, being more deliberate, provides a way to identify the best and most appropriate feelings" (1984, p. xiv). But Ruggiero also believes that to solve problems and make decisions clearly, impartially, and critically, we must "move beyond feelings" (p. xiv). Vivian Rosenberg (1986, p. 4) argues that, far from moving beyond or attempting to eschew feelings, we should focus on feelings as we teach thinking and add "affective awareness" to our repertoire of critical thinking skills: (1) "personal psychological insight—the individual's ability to identify, to appropriately express, and to some extent understand his or her own emotions" and (2) "empathy skills—the individual's capacity to understand and appropriately respond to someone else's feelings."

The elevation of feelings to a central position in the understanding of human behavior, ours and others', is completed by Arlie Russell Hochschild (1983, pp. 30-31), who argues that feelings, as clues or signals, are human senses, like seeing and hearing, that help us to know the world better and to test reality better by signaling an inner, often unconscious, perspective. Thus, emotions can help us achieve two of the hallmarks of critical thinking: reasonableness and objectivity.

Blending these three approaches together, we can say that as we deliberately and systematically focus on our and others' natural, spontaneous feelings—bodily sensations that are complementary to and intertwined

with thought—we become more aware of our and others' viewpoints on the world so as to better understand, evaluate, and guide our thoughts, beliefs, and actions. Holistic critical thinking!

Critical Thinking for Transfer Students

Parallel to the implementation of Title V regulations for the associate degree, colleges are continuing to determine which courses can be used to satisfy the general education requirement in critical thinking for transfer to the California State University (CSU) system. Within the broad outline of the lower-division, general education framework, and subject to the approval of the CSU chancellor's office, each California community college (CCC) has been authorized since 1969 to design and make available to transfer students a thirty-nine-unit general education program that, if certified partially or fully, each campus of the CSU must accept for credit, even though the CCCs have used courses to satisfy general education sections that the CSUs would not accept from their own native students or from "uncertified" transfer students. For example, often CSUs accept only the traditional public speaking or oral communication course to satisfy the speech communication category, but they must accept such courses as Interpersonal Communication or Introduction to General Semantics if certified by a CCC. One result of this practice is that students graduating from the same CSU have had a substantially different general education experience given the wide variety of courses that CCCs certify in various categories. For example, in satisfying the lower-division general education requirement in humanities (the CSUs require nine units of upper-division general education also) at San Diego State University, a native student may present Mythology, Western Civilization, and World Religions; a transfer student from one CCC may present Intercultural Communication, Discussion—Group Thinking and Decision Making, and Drawing; and a transfer student from another CCC may present American Sign Language, Introductory Spanish for Spanish Speakers, and Jazz History and Development.

The relevance of this point to critical thinking is that graduates of CSUs also have had markedly different critical thinking experiences as a result of the variety of courses that CSUs offer and that CCCs certify in that category, as this list illustrates: Critical Thinking, Symbolic Logic, Debate and Persuasion, Intermediate Composition, Statistics, Calculus, Introduction to Literature, Forensics, Argumentation, Constitutional Law, Public Speaking, Computer Algorithms and Programming, BASIC/Pascal/FORTRAN/COBOL or PPG II Programming, Group Discussion, and Introduction to Program Design! The obvious question is irresistible: When was the last time that the students in, say, a COBOL class studied the informal fallacies of ethnocentrism, conformity, face saving, stereotyping, and prejudice?

One CSU has no critical thinking category in its general education

pattern because the faculty believes that critical thinking permeates the curriculum (a belief that is not supported by research). The same situation holds throughout the entire University of California system. This variety in California's three systems of higher education calls into question any assumption of a universal consensus on the meaning of critical thinking.

Two Approaches to Campuswide Implementation

At least two community colleges have adopted a holistic approach to critical thinking, with both cognitive and affective and classroom and nonclassroom dimensions.

Grossmont College, El Cajon. Well before the Title V mandate, the curriculum and general education committees of Grossmont had determined that for a course to qualify for inclusion in the general education pattern of the associate degree, it had to satisfy the criterion of critical thinking, that is, the course had to "require the student to make critical comparisons of the principles or beliefs or knowledge in the general area covered by the course." As a result, during the past decade of the evolution of interest in critical thinking, the general education committee has created a subcommittee to orchestrate critical thinking activities, spearheaded the raising of consciousness about critical thinking across the curriculum by means of semiannual workshops for faculty and staff during Professional Development Week, adopted a comprehensive definition of critical thinking and of the critical spirit to serve as a campuswide guideline, and established a Center for the Cultivation of Critical Thinking to serve as a focus for the continued exploration and implementation of critical thinking theory and practice across the campus and across the greater San Diego community. The comprehensive definition adopted by the general education committee, after months of deliberation, is as follows: "Critical thinking is fair-mindedly analyzing, interpreting, evaluating, and synthesizing arguments, information, or experience with a composite of reflective abilities, dispositions, and values to guide our thoughts, beliefs, and actions. The desire and commitment to thinking critically in all important aspects of one's life is the 'critical spirit.' " Appended to this definition is a list of recommended abilities, attitudes, and values.

Gavilan College, Gilroy. An expansive, methodical approach to creating an environment and process by which critical thinking can permeate the campus, not just the curriculum, has been underway at Gavilan College since 1986. Trustees, administrators, faculty, and classified personnel have cooperated in this pioneering effort, the objective of which is to have Gavilan students become better critical thinkers "because those responsible for the students' education will have improved their own skills so modeling can occur" (Klein, 1988, p. 8). According to Klein, students will encounter critical thinking in a general education course and in all of their classes as, increasingly, "classes are taught by Critical Thinking models who have

embraced the ideals of the discipline into their lives" (p. 8). My assumption is that exclusive reference here to classroom teachers is inadvertent, since a genuine permeation of critical thinking across the campus, which I take to be Gavilan's focus, would mean that students encounter models who have embraced critical thinking ideals and practices among *all* those responsible, albeit in different ways, for their education: trustees, administrators, instructional and noninstructional faculty, and classified personnel.

Evaluation

Unfortunately, little can be said at this time regarding whether or not the statewide mandate requiring critical thinking in all college-level courses has had any qualitative impact on the students' education. Colleges are not required to report to the chancellor's office on how they intend to measure the effectiveness of this project. Therefore, such information has to be sought on a college-by-college basis. Even Gavilan College, which is much further along than are most other CCCs, is only in the initial stages of the evaluation process.

Instruments do exist to evaluate the quality of students' reasoning skills, such as Shipman's (1983) *New Jersey Test of Reasoning Skills* and Watson and Glaser's (1980) *Critical Thinking Appraisal*. A complete list is available from the Center for Critical Thinking at Sonoma State. However, if a college's concept of critical thinking includes attitudes and values as well as reasoning skills, then a combination of instruments will need to be used, at least until an instrument that measures all dimensions is developed. The establishment of a subcommittee, with a psychometrist as a member, would seem to be needed for this task.

Conclusion

On the same day that I was writing the particular paragraphs of this chapter on the affective dimension of critical thinking, I heard a physician, the host of a local radio show called "Feeling Good," opine that in spite of such rational actions as exercising, eating nutritionally, and taking vitamin supplements, if attitudes such as self-esteem are unhealthy, we will still get sick. I submit this analogy to critical thinking: No matter how proficient we may become in our use of reasoning skills, if such use is not informed by attitudes such as fair-mindedness and empathy, then our proficiency in the skills of reasoning may simply make us more effective promoters of our own ego- and ethnocentrism. Terrorists, for example, impeccably adept at every thinking skill, may more effectively and efficiently wreak their havoc.

Critical thinking must be formulated holistically as a mosaic of certain interdependent mental and affective components, including Glock's (1987) and Ennis's (1987) skills and abilities, attitudes, and dispositions and

Paul's (1987) intellectual and ethical virtues, in which the essential values of critical thinking are implied and by which the use of the skills and abilities must *always* be informed if critical, as opposed to sophistic, thinking is to be achieved. With this formulation we satisfy the criteria of the "critical spirit" advocated by Siegel (1987, p. 1): "In order to be a critical thinker, a person must have (in addition to skills of reason assessment) certain attitudes, dispositions, habits of mind, and character traits."

We can strive for no less than a holistic approach to critical thinking if our ultimate purpose, in Marcuse's (1969, p. 46) words, is to "enhance, protect, and unite life on earth." And this striving will be most effective and creative if we practice what we preach. That is, in our study and implementation of critical thinking, we must adhere to its essential principles and practices, especially self-criticism: the willingness to subject our own biases and beliefs, however cherished, to scrutiny.

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JOHN FEARE is director and counselor at the Center for the Cultivation of Critical Thinking at Grossmont Community College, El Cajon, California.

Vocational, technical, and occupational faculty need concrete strategies for preparing their students for the workplace of today.

Teaching Critical Thinking in Vocational-Technical and Occupational Classes

George A. Heyman, Elaine R. Daly

As business shifts from manufacturing to service, people skills, including oral and written communication skills, are becoming increasingly important. People need to learn to think about how these changes will affect their work. The abilities to make connections between the outcome of an event and its cause and to anticipate changes rather than just react to changes are valuable thinking skills. In an increasingly complex world, problem-solving and model-building skills (construction of paradigms that can be used as guides to thinking in the terms of a particular profession) are becoming more important. No longer can technical skills be taught in a vacuum. It is not enough to type a monthly report, fix a person's car, or set up a computer system. The client (customer) must also be serviced. Each client has specific needs, and often the decisions that are made by the technical expert will have long-term effects for the client.

Not in a Vacuum

Exploration of expectations based on previous experiences is a vital component of the teaching of critical thinking skills. It helps students understand the contexts in which certain activities are done. Start by asking students to define what a professional in a particular vocational field looks like and what he or she does. Use visualization techniques to have students picture in their minds an image of a typical person in the field of study. Results may be humorous, such as the image of accountants as "ink-stained

wretches with green eyeshades." This image making gives students a framework in which to discuss what professionals actually do in their work, as well as to dispel other myths about them. For example, the fact that many accountants work in law enforcement, especially in jobs that pertain to white collar crime, lifts at least a few eyebrows. Once students have an idea of what a modern accountant does, historical anecdotes can be used to show how accounting and accountants have evolved to their present roles.

A historical anecdote such as the following could be used to get students to think about the conditions in which new occupations develop:

> Thousands of years ago, hunter-gatherers realized that certain grains could be harvested and stored for later use. This meant that a steady food supply could be obtained from one area; this was an economic innovation. An entrepreneur took this new resource and put it to practical use by creating property, which is a condition of capitalism. No longer did people need to follow game. They now could turn their thoughts to development of the land. However, people now had to depend on others for certain items to complete their diets and to maintain their property rights. This mutual dependence led to the invention of new ways to work the land. But, invention is not innovation. Unless someone, an entrepreneur, puts the idea to practical use, invention has no effect on economic growth.

Questions: (1) What items may have made up the first exchanges? (2) What would the medium of exchange have been? (3) Identify a professional role appropriate to this type of economy. (4) Give examples of how or when a machine repair technician would be needed.

Literature and Accounting

Literature can be used in vocational-technical and occupational classes to help students understand the interactions between the professional and the business environment. For example, in accounting, the word *audit* tends to evoke trepidation. After the concepts of auditing have been taught, the role of the auditor and his or her interaction with the client can be explored. The relationship between client and auditor is complex. Even though the auditor is supposed to remain independent (unbiased in mental attitude) toward the client, the client still pays the fee. To set the stage for a discussion of this interaction between client and auditor, the poem " 'Twas the Morn of the Audit" (Lubell and Lubell, 1989) can be used. This poem, a takeoff on Clement Moore's poem "A Visit from St. Nicholas," stimulates students to think about what takes place during an audit. But more important, the poem sets the tone of an audit and helps students feel the atmosphere of an audit rather than just learn about the operational details.

This intuitive feeling becomes critical when students realize that auditing is a thought process. The facts (how to account for transactions) have been learned in other accounting classes. The key now is to allow students to use those tools and, with the aid of a few basic concepts, learn to think like an auditor. One basic concept is learning how to satisfy the third standard of fieldwork in auditing, which states that sufficient, competent evidential matter is to be obtained through inspection, observation, inquiries, and confirmation in order to establish a reasonable basis for an opinion regarding the financial statements under examination. This auditing standard affords a great opportunity to use critical thinking skills in the classroom. Judgment must be used to answer the questions of what constitutes competent evidential matter, what is reasonable, and what is the most effective and efficient way to accumulate this evidence.

To help students learn to answer these difficult questions, consider turning to Sherlock Holmes, a master of evidential practice. In Sir Arthur Conan Doyle's *The Sign of The Four*, the two chapters "The Science of Deduction" and "The Statement of the Case" depict rather than simply tell about the critical thinking skills that a good auditor needs. The concept of deductive reasoning can be explored and put into an auditing context. For example, if someone is suspected of using company funds for personal use, what conditions might exist for him to attain the funds and how could the auditor gather evidence to support this premise? Holmes's technique of open-ended questioning, his refusal to make unwarranted assumptions, and his tenacious pursuit of a trail of evidence are similar to what real auditors must do in following an audit trail.

Case Studies and Oral Communications

The study problems at the end of a chapter in a textbook usually do not reflect typical business situations. The study problems most often cover only one simple topic, tend to be very specific in their instructions, and thus do not call upon thinking skills. Textbook practice sets, while more comprehensive, appear to be more useful as tutorials than as exercises in critical thinking. One way to promote thinking is to assign research papers. But how often do employees do such papers in the workplace? In almost every occupation, the response to situations and problems is to write reports, business letters, and memos. Moreover, in occupations such as accounting, most instructions are given orally through interaction with a client or the client's representative. As a result, the auditor, for example, should ask questions in such a way that he or she can distinguish between what the client really needs and what the client thinks are his or her needs.

Appropriate analysis of the situation, good question-asking techniques, and sound reasoning are the tools needed to solve most complex problems. The task of teaching students to use these tools can be difficult and tricky.

The first step is to teach students how to ask appropriate questions. Some guidelines for formulating good questions are the following:

1. Ask clear questions. Clarity is vital. Exclude unnecessary words or phrases.
2. To get new ideas or new and diverse solutions, begin a question with phrases such as How can . . . ? What if . . . ? If this . . . then what?
3. If the goal is to get an evaluation, judgment, or opinion from the client, use phrases such as "Do you agree?" "Would it be better if . . . ?" "Which do you prefer?" "What do you think of . . . ?"
4. Do not solicit or suggest a preferred answer. Begin with a word such as *describe, why, demonstrate,* or *explain.*
5. Allow enough time for a response. The person questioned may need a moment or two of "think time."
6. Finally, allow enough time for students to formulate additional questions based on the responses that they hear. Neither they nor their teacher should be afraid of silence.

Teachers in vocational-technical and occupational programs can often get help from colleagues in different fields. For example, a professor of English can help to develop exercises that teach listening and question-asking skills in an accounting class.

Problem Solving and Models

Whether one is in accounting, data processing, auto mechanics, or office systems technology, it is clear that the world is becoming more complex. Problems need to be identified and alternative solutions sought. The alternatives must be analyzed both quantitatively and qualitatively before a final decision is reached. For example, the owner of a small business needs to purchase a computer system. First, identify the problem: Why does the business need a computer? What will be its primary and secondary uses? Second, what are the alternatives? (1) Buy a microcomputer system. (2) Rent time on a large computer owned by another firm. (3) Send work out to a data processing service. The dollar costs as well as the benefits and drawbacks of each of the alternatives should be determined. Finally, compare and contrast each alternative to determine the one that best fits the needs of the company.

Presentation of a case setting, such as the one just described above, can create an environment in which students discover for themselves the implications of each proposed solution to a problem. Students can discuss alternatives among themselves, which is an opportunity for collaborative learning. The important point here is that students learn to support their conclusions when the problem presented has many possible answers.

The ability to work with and to build models is becoming more important with the use of computer technology in virtually every occupational field. A computer program can be used to set up a model of an analytical problem, and numerous variables can be tested in a very short time. Consequently, it is important for students to learn how to set up a problem, how to choose or build an appropriate model, and how to manipulate the variables. The results will be only as good as the students' assumptions and data.

Critical thinking is very important when making assumptions about the problem and the appropriate model. For example, if a student is trying to use a model that predicts the effect of a price change on sales, assumptions must be made about how the reaction of competitors influences the model. Will the competitors watch the price change and do nothing? Most students are familiar with price wars where no one wins. The student must formulate a theory about what is likely to happen and then choose or build a model that works best with the theory that he or she has developed.

Consistency in Testing

If critical thinking skills are developed, the student should be able to use these skills on tests. It may be easier for the teacher to give multiple-choice tests, but many times a simple error yields a wrong answer. The student may know the material but still get the problem wrong. Multiple-choice tests that say "Answer questions 21–25 with the following information" are especially difficult when question 23 depends on the answer to question 21. The order of the questioning is also important. It should follow a logical sequence.

Testing of critical thinking skills is best done with problems in which the set-ups and assumptions are important components and partial credit is given for the reasoning used in solving the problems. One- or two-paragraph case studies are thus ideal tests of critical thinking skills. True, it is more difficult to grade an exam with case studies. However, this kind of exam tests the students' abilities to work with the subject, and it is consistent with the critical thinking skills that are taught in the classroom. Case studies in which solutions are written up in the form of business letters or interoffice memos may serve as evaluation tools in place of tests. Less class time for testing means more subject material can be covered in the class time period.

Conclusion

A major difficulty with infusing critical thinking into the classroom is that there will probably be initial resistance to the techniques. Students may object to writing in a vocational course, or to working in groups on cases.

Also, there is extra work for the instructor. The teacher may have to develop working relationships with faculty in other disciplines to help learn critical thinking techniques. Occasionally, it may seem that time is being taken away from the subject matter taught, but ultimately students will learn as much, if not more, than they would have under more traditional approaches. While the shortest distance between two points is a straight line, it is not necessarily the most interesting or instructive way to teach critical thinking.

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GEORGE A. HEYMAN is professor of accounting at Oakton Community College, Des Plaines, Illinois. He is also a certified public accountant.

ELAINE R. DALY is associate professor of data processing at Oakton Community College.

An annotated bibliography is provided on the integration of critical thinking skills into the community college curriculum, including general background on the topic, the application of critical thinking skills in developmental education classes, the incorporation of these skills into writing instruction, and the application of skills instruction across the curriculum.

Sources and Information: Critical Thinking Skills Instruction in the Community College

Diane Hirshberg

This volume presents an overview of efforts in community colleges to incorporate critical thinking skills into all aspects of the community college curriculum. The chapters underscore the importance of teaching problem-solving and thinking skills to students, both to enhance the learning skills of students and to rejuvenate faculty.

This chapter reviews recent documents and journal articles in the ERIC database that highlight the incorporation of critical thinking and learning skills into community college instruction. Most ERIC documents (references with ED numbers) can be read on microfiche at over eight hundred libraries worldwide. In addition, most can be ordered on microfiche or in paper copy from the ERIC Document Reproduction Service (EDRS) at (800) 443-ERIC. Journal articles are not available from EDRS. Most journal articles can be acquired through regular library channels or purchased from University Microfilms International Articles Clearinghouse at (800) 521-0600, extension 533.

General Articles

These articles present a general overview of efforts to integrate critical thinking skills into learning activities throughout the community college. They also discuss the purpose of these efforts.

Miami-Dade Community College District. *Recommendations on "Learning to Learn."* Miami, Fla.: Miami-Dade Community College, 1989. 47 pp. (ED 313 077)

In fall 1987, the Learning to Learn Subcommittee was formed at Miami-Dade Community College (MDCC) to help design a course in teaching-learning theory, to identify effective student behaviors and teaching strategies to develop critical thinking skills, and to develop strategies to implement the learning-to-learn concept across all disciplines. The subcommittee made the following recommendations: (1) The work should be continued by an ad hoc committee, whose focus should be to highlight existing course objectives, develop and reinforce strategies for integrating critical thinking skills into learning activities throughout the college, and to develop stand-alone workshops and courses addressing critical thinking and ethics. (2) The focus on critical thinking should be institutionalized. (3) The course Effective Teaching and Learning in Higher Education should include stand-alone modules on teacher characteristics and teaching styles, learner characteristics and learning styles, motivation of students, course planning, development of practical applications, and application of institutional resources to classroom teaching and learning. (4) All course modules should be made available to the individual MDCC campuses as independent units. And (5) a teaching-learning resource center should be established on each campus to house materials on critical thinking. A course outline of Effective Teaching and Learning in Higher Education is appended to the volume.

Novak, J. A., and Dettloff, J. M. "Developing Critical Thinking Skills in Community College Students." *Journal of College Science Teaching*, 1989, *19* (1), 22-25.

Most community college faculty have expectations that their students can read, solve problems, take tests, study, and think critically. However, research at Wayne County Community College showed that many community college students are at a concrete level of cognitive development and lack the ability to reason abstractly. Novak and Dettloff present two strategies to remedy this problem by providing concrete thinking students with opportunities to develop and use formal or critical thinking skills: (1) task analysis procedures and (2) long-term investigations in the classroom. Examples of how the authors use these strategies are included.

Storinger, R., and Boehm, L. *Critical Literacy Project: Final Report*. Des Plaines, Ill.: Oakton Community College, 1988. 130 pp. (ED 317 243)

This document provides an overview of the critical literacy project (CLP) at Oakton Community College. The CLP includes a year-long faculty development seminar designed to help faculty reevaluate teaching strategies and redesign courses to include critical reading, writing, and thinking. The CLP addresses problems common to many community colleges, including a large proportion of students unable to read, write, and think at the college level; lack of student awareness of or concern with their academic

deficiencies; and lack of student motivation to improve their skills. During its first semester, the CLP seminar focuses on theory, definition, and hypothesis. The second semester deals with practice, as participants concentrate on developing or revising assignments collaboratively. Most of the CLP participants expressed renewed enthusiasm about their work as a result of the program, and library and learning laboratory staffs are adapting critical literacy principles to their work. In addition to the seminar, the CLP includes four other components: (1) a national conference sponsored by Oakton Community College, (2) a regional consortium for sharing expertise and information on critical literacy, (3) a promotional video, and (4) CLP faculty presentations at professional meetings and consultations at colleges interested in building similar programs.

Critical Thinking in Developmental Education

All students need to develop critical thinking skills in order to succeed in both school and the workplace. Developmental education students, however, often come to the community college lacking even basic problem-solving skills. The following sources provide examples of programs designed to meet the particular needs of this group of students.

Benander, L., Cavanaugh, L., and Rubenzahl, I. "Ideas in Practice: A New Equation in Developmental Mathematics." *Journal of Developmental Education,* 1990, *14* (1), 26-28.

The authors describe the two-day Group Problem Solving Program, which was developed for students in a basic mathematics course at Greenfield Community College in order to create a positive learning environment to enhance student confidence. The program utilizes group-building exercises and initiative problems (problems with physical solutions) to foster communication, problem-solving skills, and math confidence. The outcomes of the program, as indicated by student evaluations, included an improved learning atmosphere, increased interest and confidence in mathematics, and improved relationships among the students and between the students and the instructor.

House, E. B., Dodd, W. M., and Presley, J. W. "Problem Solving: A Link Between Developmental Writing and Reading." *Teaching English in the Two-Year College,* 1988, *15* (2), 81-87.

The authors contend that by teaching at-risk college students the vocabulary of problem solving and by showing them how to use problem-solving strategies, they can help students improve both their reading and writing skills. When writers are given reading strategies and concrete ways of dealing with assignments, they have a greater chance of improving their reading and writing skills. The authors provide examples of the techniques

that they use to teach students in writing classes various approaches to solving writing and reading problems. The results of the program include the discovery by students that their newly acquired thinking skills are applicable to other disciplines. In addition, the students realize that they have learned sophisticated, not remedial, thinking strategies.

Stone, N. R. "Developing Critical Thinkers: Content and Process. Ideas in Practice." *Journal of Developmental Education*, 1990, *13* (3), 20–22.

In this article, Stone describes her revision of a developmental study skills course in order to include unified content and instruction in strategies for critical thinking, reading, and writing. The revision was based on William Perry's theory positing nine states of cognitive and motivational development for college students. The course required daily journal writing, reading lessons, library research, and final oral and written reports. Outcomes included enhanced motivation, reading comprehension, and thinking levels for the underprepared freshmen in the course. In addition, compared with previous years' students, the students in the course had a higher attendance rate and a lower failure rate and left the class with stronger language facilities.

Wilson, J. K. *L.A.N.D.: Critical Thinking Workshop with Applications for Developmental Students*. Flint, Mich.: Charles Stewart Mott Community College, 1988. 8 pp. (ED 301 287)

Guidelines are provided for the development of a community college course in critical thinking. The first sections offer an overview of the nature and basic concepts of critical thinking, indicating that (1) the skills developed in critical thinking classes include the ability to formulate a clear statement of a thesis or problem, evaluate evidence in accordance with the canons of inductive and deductive logic, view a particular problem in a larger context, and generate alternative hypotheses in relation to the problem; (2) during their college years, students advance through phases characterized by basic dualism, relativism, and commitment; (3) classes should take into account students' subjective input and the conceptual, perceptual, and largely subjective impact of language; and (4) deductive and inductive logic serve as analytical tools for critical thinking. The final sections contain suggestions for introducing critical thinking skills in developmental classes. Organizational suggestions stress the value of small group work, completion of initial assignments in class, and required attendance. A course description is presented, including a brief outline of course objectives and content and of student assignments.

Critical Thinking Skills in Writing Instruction

The integration of critical thinking skills into writing instruction can help students improve not only their writing and reading skills but also their inquisitional and problem-solving skills for all disciplines.

Arp, L., and Kenny, K. "Vital Connections: Composition and Bibliographic Instruction Theory in the LRC." In M. Holleman (ed.), *The Role of the Learning Resource Center in Instruction.* New Directions for Community Colleges, no. 71. San Francisco: Jossey-Bass, 1990.

Arp and Kenny contend that librarians involved in instruction must know more than bibliographical instruction theory in order to adequately prepare their students. They argue that the ability to access information now constitutes an important part of the definition of literacy, and that librarians therefore must teach this skill to students. The authors review the trend in composition instruction in two-year colleges toward the inclusion of critical thinking skills, as well as the growth in programs on writing across the curriculum. They then discuss parallel developments in the field of bibliographical instruction. Finally, they present an example of a program that integrates critical thinking skills, new technologies, and program assessment into their college's English curriculum.

Stephenson-Miles, B. "Composition and Critical Thinking Through Cooperative Education." Paper presented at the 27th annual conference of the Cooperative Education Association, San Antonio, Texas, April 3-6, 1990. 30 pp. (ED 320 632)

At LaGuardia Community College, students enrolled in the cooperative education program complete three internships and concurrent seminars as requirements for graduation. The seminar curriculum provides a theoretical framework for analyzing and evaluating the students' internship experiences. The seminars also provide a framework in which to improve students' critical thinking skills and writing abilities. Students are required to keep weekly logs to record the facts learned, their activities, and incidents observed at the internship sites. They are also required to critically analyze each of the items listed in their logs, using Bloom's taxonomy as a guide. Infusion of critical thinking methods into the internship experience requires the following: (1) developing a statement of philosophy that identifies the strategies and methodologies to be used, (2) taking the classroom situation into consideration when planning the curriculum, (3) identifying the target population, (4) creating course objectives, (5) preparing activities that stimulate all cognitive levels, (6) developing evaluation instruments, (7) selecting materials to assist students at each developmental stage, (8) sharing and exchanging ideas and insights, (9) setting a realistic time frame for achieving goals, and (10) keeping notes and records on program successes and areas of improvement.

Tripp, E. L. "Speak, Listen, Analyze, Respond: Problem-Solving Conferences (Instructional Note)." *Teaching English in the Two-Year College,* 1990, *17* (3), 183-186.

Tripp argues that teachers must find new ways to integrate the critical

thinking skills of writing, speaking, reading, and listening into the curriculum. She describes units in her oral and written communication courses that meet this goal. Tripp places her oral communication students into problem-solving conferences, which require participants to define, analyze, brainstorm on, and evaluate problems before determining and implementing solutions. In her technical writing course, Tripp assigns group-produced analytical reports that must be based on primary research. Often these reports are on school-related problems, topics that facilitate data collection and make the research process easier. Groups collectively conduct research and write, edit, and submit the papers. This project constitutes one of the major report grades in the class.

Critical Thinking in Other Disciplines

Critical thinking and problem-solving skills can be taught in any discipline, thereby improving the academic success of students and helping empower them in their learning.

Bell, J. "A Guide to Critical Thinking for Maryland Social Scientists: A Summary Report of Ideas and Resources." Unpublished manuscript, Howard Community College, Columbia, Maryland, 1988. 55 pp. (ED 296 770)

Designed for community college social science instructors, this compilation of materials provides an overview of the literature on critical thinking. Ideas are presented concerning the importance of teaching critical thinking, conflicting opinions about the essence of critical thinking, pros and cons of teaching critical thinking, problems in defining the concept, and seven steps involved in critical evaluative thinking. The next sections focus on (1) seven considerations in deciding what to teach; (2) the components of critical thinking, that is, understanding, analyzing, and evaluating a secondary source, developing criteria to evaluate evidence, evaluating a primary source, and writing papers that require the creation of arguments and the evaluation of evidence; (3) ways to develop or reinforce students' dispositions toward effective thinking; (4) the attitudes or characteristics of critical thinkers; (5) ways in which instructors can help students become better critical thinkers; (6) assessment of thinking skills; and (7) initiation of critical thinking instruction. Class projects or individual assignments used by social science instructors to develop critical thinking skills are described.

Knight, C.L.H. "Teaching for Thinking in History and the Social Sciences." Paper presented at the workshop, What Current Curricular Trends Tell Us About General Education, held prior to the 7th annual convention of the Virginia Community College Association, Roanoke, October 12-14, 1989. 18 pp. (ED 325 189)

Critical thinking has been defined as reasonable, reflective thinking

that is focused on deciding what to believe or do. Since the social sciences require practitioners to ask relevant questions, develop appropriate evaluation criteria, generalize from observed facts, conceptualize hypotheses, and make judgments, critical thinking skills should be incorporated into the teaching of the social science disciplines. Beyond merely providing students with facts and theories, the teaching of thinking optimally produces a critical and creative disposition that enables a person to transcend biases, evaluate situations and ideas objectively, and create habits of mind that transfer to actual life situations. A class that incorporates critical thinking skills should include instruction in decision making, problem solving, conceptualizing, and classifying and should emphasize creativity in the thinking process. Of particular importance is the skill of argumentation. Students are empowered through the development of their thinking skills, and this empowerment makes them equal partners with their instructors in the business of learning.

Sachs, S. G. "Teaching Thinking Skills to Distant Learners." *TechTrends*, 1990, 36 (1), 28–32.

Sachs discusses thinking skills for college students and describes strategies that can be used by faculty to teach thinking skills in distance education courses. He argues that any strategy for teaching thinking skills to distant learners must use a more structured approach than would be applied in a traditional classroom. He suggests criteria for teaching thinking skills to distance learners and presents methods for teaching problem solving, information evaluation, and decision making.

Self, C. C. "Teaching Generalized Problem Solving and Science as a Process." Paper presented at the national conference on Student-Centered Learning, Bellingham, Washington, May 27, 1988. 10 pp. (ED 301 247)

Two instructors at Bunker Hill Community College in Massachusetts have developed a unit of study designed to teach biology as a process, improve students' critical thinking and reasoning skills, and provide students with the opportunity to express these skills in writing. The instructional strategies employed in the unit are superimposed on a traditional and audiotutorial biology course. The unit includes the following components: (1) Students are presented with two papers, a natural science study and a study pertaining to the field of science education, to help them learn to differentiate between the natural sciences and disciplines that use the procedures of science, and to acquaint them with both the structure of an academic paper and the concept of a controlled experiment. (2) Students meet in small learning groups to analyze the papers, uncover errors that can lead to incorrect conclusions, and determine how these potential error factors are controlled. And (3) students are given another set of scientific and nonscientific papers to look for errors in logic and experimental design

and then asked to redesign the experiment. A preliminary study reveals some success with this inductive process.

Tripe, R.L.K. "Problem Solving and Writing: A Teaching/Learning Model for Computer Studies." Paper presented at the 12th International Conference on Teaching Excellence and Conference of Administrators, Austin, Texas, May 20–23, 1990. 35 pp. (ED 324 039)

In an attempt to combat the problem of poor writing and problem-solving skills among technical program graduates, Mohawk College of Applied Arts and Technology in Ontario, Canada, began implementing changes in its computer studies curriculum. The first change was to sharpen the focus on improving students' writing skills. Writing assignments were developed to be relevant to students' chosen fields of study and future careers and were evaluated by both faculty and students. Another change was to augment the content-driven technical courses with the teaching of problem-solving skills. A model was developed for incorporating problem-solving strategies into the computer programming curriculum through a three-step process. The students (1) define the nature of a programming problem in their own terms, (2) reformulate the problem and its proposed solution through a clear and unambiguous sequence of steps, and (3) translate the solution into a language (or "program code") that can be fed to the computer for action. This three-step model has been used in several courses.

DIANE HIRSHBERG is user services coordinator at the ERIC Clearinghouse for Junior Colleges, University of California, Los Angeles.

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From the Editor

Community college curricula must address critical thinking, analytical skills, values clarification, and related thinking skills in order to ensure that graduates have the skills needed to successfully face the challenge of work or further education. This volume of *New Directions for Community Colleges* considers ways in which higher-level thinking skills can be integrated with content and taught across instructional disciplines and means by which instructors and administrators can become involved in these efforts. The authors in this volume were selected because of their firsthand participation in the critical thinking movement and their expertise in teaching thinking skills.

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